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PROJECT MANAGEMENT OF VIRTUAL TEAMS: A QUALITATIVE INQUIRY

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ABSTRACT

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From the last century every aspects of life have been revolutionised by numerous Information Technology (IT) developments and by the expansion of the Internet. Physical boundaries for information availability, or for collaboration and communication no longer exist in the society of information. In relevance to new work forms, members of the same teams do not necessarily have to sit next to each other in order to contribute to the same project. Virtual project management has become a widely spread form of cooperation. In parallel, a new IT technology, namely cloud computing has been developed, and it has been spreading with an amazing speed all around the world.

In light of the above, the purpose of this research is to identify the perceived advantages and challenges in the project management of virtual teams. Furthermore, this study aims to reveal the supportive functions of cloud computing tools in the project management of virtual teams. Purposing the research questions, this thesis is philosophically based on the hermeneutic paradigm of qualitative methodology. The research data was generated through online questionnaire surveys with 21 virtual team participants, including members and managers, and through qualitative interviews conducted with 5 virtual project managers.

The theoretical framework of the research at first describes conventional project management in general, then a new line of project management is introduced. Furthermore, the concepts of virtual team and cloud computing, and their benefits and disadvantages are expounded based on the review of previous academic literature. To add more, preceding studies related to the connection of virtual project management and cloud computing are discussed.

Based on the results of this thesis, five supported advantages and six supported challenges in the project management of virtual teams have been identified. Other emerging advantages and challenges have been found as well. Furthermore, the results indicate that cloud computing tools are necessities in virtual project management, and adopting cloud computing supports achieving higher efficiency and better decision making within the virtual team. Also, several indirect consequences of cloud computing adoption in virtual project management have been revealed by this master's thesis.

All in all, as results of this master's thesis, better insights about virtual project management and about the supporting functions of cloud computing adoption in the project management of virtual teams have been gained. The findings may assist virtual project managers and companies using virtual teams in creating more effective processes, and collaborations with faster information flow, and with less frustration among the members.

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List of Abbreviations Used

CMAC – Computer - Mediater Asynchronous Communication

CRM – Customer Relationship Management

Email – Electronic Mailing

HaaS – Hardware as a Service

IaaS – Infrastructure of a Service

ICT – Information Communication Technology

IoT – Internet of Things

IT – Information Technology

MBA – Master of Business Administration

PaaS – Platform as a Service

PC – Personal Computer

SaaS – Software as a Service

UK – United Kingdom

US – United States

USA – United States of America

WWW – World Wide Web

1. INTRODUCTION

1.1. Evolution of information society

The XXIst century is undeniably the era of information society. Nowadays, the globe is enmeshed by millions of networks. Satellites are circulating around the Earth right now and are broadcasting tons of TV programs, or forwarding phone calls whom target audience can be located anywhere in the world. Each and every one is connected by telephone, or especially by the Internet. In global communication and availability of information there is almost no limitation. Mankind, however, has achieved this level of globalization during a relatively short period.

The first steps in the development of Information Technology (IT) might be set around the time of industrial revolution. However, here, the invention of the computer is mentioned as the first important milestone in the IT development process. Without the invention of the computer, globalization and the information society could not have evolved. "Computer stands for "Commonly Oriented Machine Purposefully Used for Technology, Education and Research" (Panigrahy 2010, p. 2). The meaning of the word computer is to calculate. This shows that the original purpose of computers were to bring off arithmetic calculations at a speed unimaginable even for the most talented people. After some less meaningful computer versions, the first automatic computer was created by Hathway Aiken and John H. Nipe in 1973. Their computer was nothing like people imagine today due to its enormous size of roughly 50 feet long and 8 feet high (Panigrahy 2010). Owing to all the further, yet here not discussed, IT upgrades, within 30 years the computers became 10000 times faster and a lot more user friendly comparing to computers of the 1950's (Panigrahy 2010).

The real change regarding the current state of the global economy and technology was brought by the company Apple. The Apple Series of Micro Computers by Steve Jobs and Steven Wazniak embodied the 'dream package' for the users. Their computers came with a keyboard, a screen, memory of some thousands characters and a processor all set in a tiny box. These computers were already menu driven and convenient for users (Panigrahy 2010). Late on, in 1981, IBM created the first Personal Computer (PC) (Panigrahy 2010). From then on, IT and Information Communication Technology (ICT) has started to fly at a speed never seen before. Computer usage started to spread and soon it became building block of business life. Computerization was a necessity for the creation of information society. Nevertheless, the invention of the Internet was the real revolutionist on the way towards information society.

Today, the Internet is an information infrastructure with a mechanism for information dispersion and circulation. It is also a new medium that makes possible communication, interaction and collaboration

between individuals regardless geographical location. The Internet is presented and influential not only in the field of IT and ICT, but economics, culture and every other aspects of society (Leiner et al. 2009).

The Internet roots in the ARPANET network that was a host-to-host network which first meaningful function regarding to information society was electronic mailing (Email). The Email was first introduced in 1972. Originally, ARPANET and its successors such as BITNET or USENET were meant for closed, academic communities. Their aim was to support the academic research studies with a globally interconnected knowledge basis available by the networks. Soon, it was expanded with satellite, radio and other networks (Leiner et al. 2009) in order to connect all the continents. However, constructing a global infrastructure that could maintain a universal interconnection was challenging. Even today, global interconnection is responsible for differencies in availability and qualitiy of the Internet in different countries. Nevertheless, the creation of a global infrastructure made possible that by today, the Internet is available for thousands of communities with the necessary infrastructure. Nowadays, especially in developed economies, the Internet has almost become a commodity. After several browsers adopting the World Wide Web (WWW) technology, users could start surfing on the Internet looking for literally any kind of information (Leiner et al. 2009).

As mentioned, the first decade of the XXIst century has brought dramatic technological changes. In an instant, the Internet became an essential part of people's everyday lives. The Internet, whether it is wireline or wireless, can operate with a speed that can exceed 100 Mbits/s. By this development in speed, nowadays, users can join online video conversations, watch movies or listen to music online, read about any of their interests on millions of websites, not to mention the options for handling financial transactions via laptops or mobile phones (Kelly et al. 2012). Finally, information society has been born. The availability of information is almost limitless. There is an affordable, global connection between all continents, countries and almost all people. Probably the most shocking in this amazing development is its quick time period. One invention triggered the next and yet, the development of IT and ICT have not arrived to an end (Leiner et al. 2009). In conclusion, the evolution of the Internet and IT have resulted a new, global economy without physical boundaries.

1.2. Emergence of a new economy

The new economy of the XXIst century is based on the above described developments and in details on the fast convergence of IT and telecommunications industry. In essence, a new, global, mobile platform has been created by telecommunications where the IT generated data can ride along cars, mobile phones, homes and workplaces (Shaughnessy 2015). All the mentioned tools belong to the

Internet of Things (IoT) which is another trend in the expansion of IT and telecommunications. The integration of these two industries have created new business platforms which will reformulate, and already have done so, politics and economics in their substances (Shaughnessy 2015).

Business platforms have been present since the first PC by IBM. For instance, enterprise resource planning systems, customer relationship management systems, sourcing databases are all business platforms. However, above the mentioned platforms, new business platforms represent when IT and business meet. New platforms are not only administrative tools anymore, but opportunities for new forms of business. The followings can serve as examples for new business platforms: MySQL for advanced data analysis, iTunes for buying music online, Amazon for online shopping, Netflix for renting movies online, Spotify for renting music online, Android operation system of mobile phones, Salesforce.com for renting cloud computing solutions, or Uber for affordable community taxi services (Shaughnessy 2015).

Narrowing the picture, an important consequence of all the triggers of the new economy is virtual project management. Virtual project management is international project management, however, it is not only about managing a project across borders, but the managed team is not located geographically at the same place, thus the team is virtual. The economy has arrived to a point when not only communication can be carried on between different countries, but common work can be maintained together with colleagues far from each other in real time. While the project management of virtual teams include previously unimaginable possibilities, and thus advantages for the companies and for the teams themselves, virtual project management has challenges as well. Virtual project management is still a new phenomena not yet completely understood, or improved to its maximum effectiveness.

In summary, the Internet and the modern IT have built new business platforms which have put in place new forms of business. In these new forms, there is no limitation in communication, geographical distance is not a disadvantage anymore, and international, distantly located communities and people can unite to work together. New, strong, powerful relationships have been created. According to Shaughnessy (2015), the essence of the emerging new economy is in the management of the newly emerged relationships. In line of this stream, the concern of this thesis is related to Shaughnessy's notion about managing the new relationships. Precisely, this thesis is going to examine the project management of virtual teams, the advantages and challenges originating in its novelty, and in its implicit characteristics. Furthermore, this thesis is going to explore another result of IT developments, a nowadays quite popular IT and business platform playing essential role in the advancement of virtual project management which is cloud computing.

1.3. Problem setting and research questions

After thorough study of the available academic works, project management is developing from traditional project work (McGhee et al. (2007), PMI (2013), Haynes (2009)) toward a global, virtual project management. More studies confirm this by AIM Strategies (2010), Brandel (2006), Saynisch (2010), or Brake (2006). Several studies about virtual teams and virtual project management have been conducted as well (Kirkman et al. (2002), Brake (2006), Malhotra et al. (2007), Berry (2011), Hunsaker et al. (2008), Pauleen (2003), Target Training (publication year unknown), Chhay et al. (2013), Jarvenpaa (1998), Amir (2010)). These studies revealed that virtual project management is widely spread in numerous industries. Even though, virtual project work has its advantages and its challenges identified, it has been noticed by analysing studies of Berry (2011), AIM Strategies (2010), Chhay et al. (2013), Kirkman et al (2002), Malhotra et al. (2007), Jarvenpaa (1998), Brake (2006), Amir (2010), Hunsaker et al. (2008), Target Training (publication year unknown) that significantly more research studies in the field of virtual teams and virtual project management focus on the challenges rather than the advantages. Therefore, even though there are several academic studies in the field of virtual project management (Berry (2011), AIM Strategies (2010), Chhay et al. (2013), Kirkman et al (2002), Malhotra et al. (2007), Jarvenpaa (1998), Brake (2006), Amir (2010), Hunsaker et al. (2008), Pauleen (2003)), there are not many works that focus on virtual project management challenges and the advantages as well. Therefore, this identified research gap and the extensity of the field of virtual project management created an interest to research further into the advantages and challenges of project management of virtual teams.

Furthermore, reading and researching in the topic of existing challenges in virtual project management (Berry (2011), AIM Strategies (2010), Chhay et al. (2013), Kirkman et al (2002), Malhotra et al. (2007), Jarvenpaa (1998), Brake (2006), Amir (2010), Hunsaker et al. (2008), Target Training (publication year unknown)) induced an interest toward studies focusing on cloud computing (Chou (2015), Wang et al. (2010), BISL (2012), Cervone (2010), Mell et al. (2011), Kelly et al. (2012), Nanavati et al. (2014), Rao et al. (2015)). Cloud computing can be considered as a possible supportive cluster of technologies for the identified challenges in virtual project management. Thus, further research was conducted about the intersection of cloud computing and virtual project management by searching for academic works in the subject. However, after thorough research about the connection between cloud computing and virtual project management, no relevant, academic findings have been gained precisely about the usage and effectiveness of cloud computing tools in virtual project management. The most closely related reviewed academic works were researching for user acceptance of Google Docs by university students (Xin 2015), for cloud

computing adoption in relation to achieving competitive advantage (IBM 2014) or to achieving business value (Forbes 2013). There was only one, not academic but corporate source (SEC 2012) found directly relating to cloud computing effectiveness in virtual project teams. Thus, a research gap has been identified at the cross-section of cloud computing and virtual project management.

Overall, the exploration within the theoretical framework determined project management, virtual team work, and cloud computing as research fields of this master's thesis which are expounded in details in the literature review based on the above mentioned academic works. Therefore, the purpose of this research is to explore and analyse virtual project management, and to find possible solutions to mitigate its difficulties. To achieve this purpose, the research has two research questions:

- What are the perceived advantages and challenges in the project management of virtual teams?
- How can cloud computing tools support the project management of virtual teams?

For conducting the research, qualitative methodology has been chosen. Furthermore, questionnaire survey and qualitative interviews are used as tools for data generation. The target group of this thesis consists of virtual team members and virtual project managers.

2. THEORETICAL FRAMEWORK

In general, the aim of theoretical framework is to gain understanding, and to introduce the already conducted studies of the researched field (Zimmel 2015). In order to get an overall and complete picture about the earlier academic research studies relating to the research purpose, all related fields need to be reviewed. Thus in this thesis, the following fields are going to be reviewed in order: project management (chapter 2.1.), virtual teams (chapter 2.2.), advantages (chapter 2.3.) and challenges (chapter 2.4.) of virtual teams and virtual project management, cloud computing (chapter 2.5.). In the last chapter (chapter 2.6.), research studies related to virtual project management and cloud computing are going to be reviewed. Nevertheless, the reviewed studies are not directly connected to the research purpose of this thesis. The reason behind this is that, as expressed earlier in chapter 1.3. (Problem setting and research questions), there are no preceding academic studies trending toward the intersection of virtual project management and cloud computing. Therefore, about the effectiveness of cloud collaboration tools in virtual project management, there are no direct, academic findings. This situation triggered to review related, but not entirely matching earlier research studies creating initiation points for the research in this master's thesis. Finally, the theoretical framework is going to be synthesized (chapter 2.7.).

2.1. Project management

2.1.1. Conventional project management

In order to give a comprehensive analysis of virtual project management, and how it differs from traditional project management, the basics of project management have to be introduced. A project is a temporary attempt with finite and limited resources, and with objectives defined in advance by the ones who are financing and are interested in it. Generally, the final aim of a project is to create a unique tangible, or intangible product (McGhee et al. 2007; PMI 2013). In this sense, temporary refers to the duration of the project, and implies a specific beginning and end date. A project is finished when its aims have been achieved, or when the project is ceased because the aimed targets cannot or will not be met, or when there is no longer need for the existence of the project. A project can also be terminated by the request of the client (PMI 2013).

Project management is the utilization and adaptation of specific knowledge, skills, practices, and tools in order to successfully meet the project requirements. According to the PMI (2013), the usage of 47 groups of project management processes are necessary to execute project management properly. These 47 groups are categorized into five extensive process groups which are initiating; planning; executing; monitoring and controlling; and closing. Additionally, project management consists of

several tasks including, but not limited to the followings: requirement identification; plan and execution of the project based on stakeholders' needs and expectations; effective communication with all stakeholders; management of stakeholders toward realization of project requirements; creation of deliverables; balance among project restraints. Finding the balance among scope, schedule, quality, budget, risks and resources is one of the most complex parts of project management. If any of the listed factors change, one or more other factors are expected to be affected too (PMI 2013). Also, for a successful project, project management has to assemble and optimize the necessary resources. These resources are the "skills, talents, and cooperative efforts of a team of people; facilities, tools, and equipment; information, systems, and techniques; and money" (Haynes 2009, p. 7). The question is how all these functions can be carried out which depends on the project manager.

2.1.2. Roles and responsibilities of a project manager

At the beginning of a project, the involved organisation assigns a person to lead the project team. That person is the project manager (PMI 2013). In general, the project manager is responsible and accountable for the planning and performance of the project, but has little authority outside of the project scope. Although each project member has its own responsibility in the project, the project manager is accountable for all project issues in one person (McGhee et al. 2007).

There are four main roles of project managers according to McGhee (2007). First of all, the project managers manage the resources and processes in order to deliver the final product. In addition, they manage the budget, and keep the time line. Secondly, project managers perform the traditional duties of functional or operational managers (PMI 2013). Therefore, they negotiate, persuade, organize, delegate, facilitate, coordinate, and build the team. Thirdly, they create, and maintain the communications plan. Fourthly, they need to understand the business purpose behind the project to be able to make the right decisions in order to execute the project (McGhee et al. 2007).

In addition to the responsibilities and roles of project managers, they also have to take care of project drivers. Project managers always have to balance among the three driving areas which are time, cost and scope / requirements. One side of this triangle will become the primary project driver, and the other two drivers will be dependant, or sacrificed. If there is a second project driver, then the management really depends on the balancing ability of the project manager (McGhee et al. 2007).

2.1.3. Toward a new project management

As an indirect consequence of globalization and IT developments, traditional project management principles do not completely cover the current discipline of project management. Increased complexity in economics and society completed with the more and more complex technology have

oriented the focus in the discipline of project management toward new notions. These notions are systematic, holistic views, complexity, problem solving, self-organisation, synergy, and network relationships (Saynisch 2010). The business landscape has changed (AIM Strategies 2010), it became more complex which cannot be handled by only traditional project management methods. Two main variances of this borning complexity are the continuously appearing new technological innovations and the new social relationships (Saynisch 2010). It brings new ways and challenges to team work conceptualization and business conduction as well (AIM Strategies 2010). Members of a team, location of the members, and the tasks they are required to fulfill have all gone through changes. Team members are not sitting in the same buildings anymore, they might even be located in different countries. Also, international teams are often responsible for comprehensive, global operations where the related duties might differ from traditional tasks, and they are often more complex. In addition, participants in international teams often concern with more business fields at the same time. All these changes require new approaches from the project managers as well. Saynisch (2010) says that a "culture of trust" (Saynisch 2010, p.35) is the key for this new project management, and for project managers of this new era to succeed. In a trusting culture, new ideas, outsiders, and new ways of cooperation are welcome which are indispensable for handling the upcoming challenges.

Already in 2006, Computerworld magazine conducted a survey in which 33 % of the respondents named project management as the number one challenge of that year (Brandel 2006). Their opinion seems to have become true in the recent years. Brandel's prognosis of the four project management challenges, and consequently the changing roles of project managers, turned out to be correct for the years following 2006. Though Brandel's challenges are rooted in the IT industry, they could be forward-looking for other fields too.

First of all, the introduced IT developments have opened the possibility for the establishment of multinational companies. In paralell, the evolving capitalism with the increasing wages in the developped countries has created the need for international operation of a company. If an organisation wanted to stay competitive, it had to outsource some fields of operation to a country with cheap labour. Or in another case, if for example a service providing company aimed to expand its market share, or wanted to break into other markets, it had to be present in other countries as well. Thus, whether due to outsourcing or business enlargement, project teams have become global. Consequently, project managers, as well as team members need to be more understanding of cultural differences. In addition, managers need to count with different availabilities because of different time zones, or national holidays during the year. To add more, implementation of the common opinion that working with virtual teams makes possible a 24/7 schedule is not an easy task to do. For instance, if

the manager does not plan well, some members might still be asleep when somebody wants to talk with them. Furthermore, languistic difficulties are there as well. Even if all the parties speak English, understanding each other can cause some delays in project operation (Brandel 2006). All in all, geographically dispersed teams bring new challenges that require special project management.

Furthermore, riskier projects, especially global projects, might require more iterative development approach. For instance, planning the whole project in advance is not always as successful as getting feedback from time to time and adjusting the project plan according to the actual conditions. Time difference, however, complicates this method too because when a European team member wants to get feedback from a colleague in Australia, that is problematic since Australians are sleeping in that time (Brandel 2006).

To add more, business in the era of information society has to rely more intensively on vendors and suppliers. Real time orders and the increasing number of requests for projects create so much demand, it is almost impossible to serve alone for one enterprise. It increases reliance on outsourcers and vendors, thus project managers need to face another new need, they need to bear the responsibility of partner relationship management, as well as coordinate the resources (Brandel 2006).

In summary, new working culture and workplace have been born. People work in the same team with different nations across the world. Different cultures meet daily, they try solving problems, overcoming the upcoming challenges, and create something together in a common, foreign language. It is certainly not easy, but as ICT has made it possible, it can also provide solutions and support in this new business environment. Shaughnessy (2015) explains that there is a digital revolution resulting in a "business anywhere, anytime" (Shaughnessy 2015, p.20) approach. This approach is undoubtedly present in the changing field of project management too. Therefore, ICT development, or otherwise called the digital revolution has opened the gates for virtual collaboration (Brake 2006). Neither geographic, nor informational boundaries are real anymore. With virtual collaboration, project teams can operate across the world smoothly, although, not without any challenges. Team members can communicate and cooperate with the help of different online and traditional collaboration tools, while project managers need to coordinate them from distance virtually. All these result in a new form of project management, the project management of virtual teams.

2.2. Virtual Teams

"Off the coast of Mexico, a team of five people struggles to stay afloat on a raft they assembled on shore. Waves crash around them, their raft begins to tip over, and two members fall into the sea. A third member

helps the submerged members back onto the raft. Finally, the raft is righted and the team paddles furiously onward." (Kirkman et al. 2002, p. 2)

As much as the above quote might sound as a scene from a reality TV show, it is a perfect metaphor for virtual teams. In fact, the quote describes a team building task for virtual teams. The fast and unforeseen change of the business environment is symbolized by the waves. The team had to construct the raft which shows their creativity and ingenuity. Overall, the exercise pointed out the challenge and operation of virtual teams, whether they sank, or swam together as a team (Kirkman et al. 2002).

The first challenge regarding virtual teams is defining it. There is no consequent, generally accepted definition. Some academicians focus on the term 'virtual' and emphasize physical locations and time zones. The expression 'virtual' is unfortunate already because its meaning is associated with "nearly, close to and bordering on" (Brake 2006, p. 116). Some might think, "If you want virtual results, create a virtual team" (Brake 2006, p. 116). However, 'virtual' can be regarded as a fortunate figure of speech, if one understands that to achieve effective team work in virtual teams, greater efforts are required (Brake 2006). Others approach the question of virtual teams from the 'team' structure, thus operation methods, or number of people. The third group is centred around technology, as the trigger of virtual teams. So the challenge lies in discovering a definition that includes all three elements (AIM Strategies 2010). Malhotra's (2007) definition of virtual teamsis considered comprehensice and that consists all three elements as required: "Virtual teams are teams whose members are geographically distributed, requiring them to work together through electronic means with minimal face-to-face interaction. Often, virtual teams consist of cross-functional members working on highly interdependent tasks and sharing responsibility for team outcomes" (Malhotra et al. 2007, p. 60).

In agreement with Berry (2011), six attributes can be asserted about virtual teams in general. First, team members often participate in virtual projects with a definable and limited membership. Even if change of responsibilities happens for a member that has little or no effect on the team. The next attribute is the interdependence of members who work for the same purpose, but mostly independently. In addition, the team takes a joint responsibility for the outcomes of the project. Furthermore, virtual members collectively manage their relationships across organisational departments. As it has been mentioned earlier, members of a virtual team might be working from great distances, but it is not always the case. At last, most of the virtual teams dominantly rely on ICTs rather than face-to-face communication in order to fulfil their tasks (Berry 2011).

2.3. Advantages of virtual teams, and of virtual project management

For companies, the use of virtuak teams is assumed to enhance flexibility, capability, and responsiveness. Its reason partly lies in the coactions and harmony among team members who have different personalities, different professional background, and different knowledge. First of all, virtual teams cease time and space being obstacles, and they are usually cost efficient (Berry 2011). Furthermore, according to Pauleen (2003), enterprises can achieve significant savings if they use properly the special allowances of specific countries. They can save the lost working hours and travelling costs of business trips too. Even if a company takes the costs of business trips or relocations, in case of a short deadline, it is not an option because of getting visas, arranging families and ongoing tasks take too long time. Another general advantage is the fact that virtual teams "can follow the Sun" (Berry 2011, p. 194) and exploit all 24 hours of a day (Berry 2011). To add more, with virtual teams, specialists can be reached for tasks without relocating them (Pauleen 2003). Also, Malhotra (2007) brings up another fact on the benefit side. He states that employees often work simultaneously in multiple teams because their special knowledge is needed at more places. This makes those individuals invaluable, so making them travel even for short face-to-face meetings would be counterproductive (Malhotra et al. 2007). Finally, due to the constant usage of electronic tools, performance documentation is automatically done (Berry 2011).

Approaching from team members' points of views, working in virtual teams evokes different feelings in different type of people. For some, working in home office is the best option they can imagine. They like sitting with their laptops in their favourite armchair in comfortable clothes at their homes. This way, they can save the time of getting ready in the morning and travelling to the office. However, characteristics can be perceived differently by different personalities. Others, for example, find the idea of working from home lonely, depressing, and disconcerting. They fear that they would miss the interaction with the colleagues, the coffee break chats, and they worry about the drawbacks of virtual teams (Hunsaker et al. 2008). In addition, some company policies of special incentives might discourage team members to work in virtual teams. Also, members who work offshore receive daily allowances above their normal salary. In contrast, virtual team members receive only their usual salary. In spite of that, they often make sacrifices to be able to collaborate with offshore team members (Pauleen 2003). Overall, there are several difficulties emerging in virtual teams as well which are going to be discussed in details in the next chapter.

Overall, the reviewed literatures reflect that several advantages in the project management of virtual teams have already been revealed and documented. Nevertheless, as the above described collection indicates, advantages of virtual project management are not expounded or researched as exhaustively

as the challenges of virtual project management reviewed below. Furthermore, comparing the extensity of the subject and the availability of studies focusing on the advantages of virtual project management as well, further study in the field is still considered relevant in the presumption of finding new, yet not exposed advantages in the project management of virtual teams.

2.4. Challenges of virtual teams, and of virtual project management

Physical distance between team members is the most obvious contrast between conventional and virtual teams. However, others like missions, tasks, or goals are not necessarily different in the two types of team work. The methods and processes of how tasks are accomplished and the specialties faced in the way of work bring the change and challenge of leading, and participating in a virtual team (Hunsaker et al. 2008).

Target Training is an international coaching company, and even though it is not an academic but a corporate source, they give valuable and relevant insight for real life virtual project management issues. Target Training has collected 12 challenges virtual teams usually face which is listed and described in Table 1.

12 common challenges of virtual teams	Description
Lack of face-to-face contact	Virtual team participants rarely or never meet their team members which can generate loneliness, or demotivation in members with more social personality.
Lack of resources	In virtual teams, if the necessary infrastructure or equipment is not available, performance can be seriously pulled back. Or resources can refer to lack of time of members in multiple teams.
Lack of dedicated team time	Virtual team members with unique knowledge might be allocated to too many teams and they cannot perform the best in none of team as a result.
Lack of clear goals	In virtual teams, information might be distorted, thus project goals are not always clear for all members.
Lack of clear roles	In virtual teams, information might be distorted, members often work in more teams at the same time, thus roles in a project are not always clear for all members.
Lack of cooperation	Getting members dedicated to work with maybe unknown people is a disadvantage of matrix organisations which is heightened in case of virtual teams since the personal contact is missing, therefore, it can cause problematic cooperation.
Lack of communication amongst team members	Ignoring each other is way easier in virtual teams because members do not have to face each other just by going to the other's desk, thus lack of communication can happen more often.
Lack of engagement / commitment	It is more difficult to gain engagement or commitment of members in virtual teams because the participants might have never met personally.
Lack of trust	Lack of face-to-face contact often result lack of trust due to the missing personal contact.

Failure to recognize, respect and reconcile cultural differences	Failure, or problems are more difficult to recognize if members do not meet personally. Especially, because loosing face in some cultures is considered "worse than death". Therefore, cultural differences have to be noticed and respected which is not an easy project management task to do online or via the phone.
Immediate manager leads virtual team as if a classic face-to-face team	Virtual team management requires different approach and knowledge above the traditional knowledge of project management from the project leader. If it is overlooked, probably the leadership is not the best for virtual teams.
Lack of training and support	Virtual team as a working form is a currently developing phenomenon that needs more training and support for and from the project management, just as well for the virtual teams from the company. Training and support might be needed in IT for effective collaboration, or the company needs to be more flexible with the working hours due to the different time zones of the members.

Table 1.: 12 common challenges of virtual teams (Target Training)

Virtual project management challenges can be further categorised into 7 classes based on the reviewed academic literature. This categorisation can help identifying the currently available academic results in a logical structure in order to reach the research purpose of this study. The 7 classes of virtual project management challenges in this thesis are communication; isolation and confusion; developing trust; performance, diversity and virtual work-cycle management; free ride; cultural differences; and time zones. In parallel, appropriate project management practices, methods, and necessary skills are discussed.

2.4.1. Communication

"Communication is the process of transferring information, meaning, and understanding between two or more parties" (Berry 2011, p. 192). Whether in traditional or in virtual teams, communication is crucial. Communication is present everywhere, in collaboration among team mates, decision making, or flow of information (Berry 2011). Virtual team members do not sit next to each other during meetings, nor they see the amount of work another colleague performs. These factors make communication a challenge in virtual projects (AIM Strategies 2010).

Computer-Mediated Asynchronous Communication (CMAC) is typical in virtual teams. In CMAC more participants can communicate in the same time, so they do not need to share information in turns. Communication is not blocked as it often happens in face-to-face teams. Also, members can express their opinions without being interrupted at a time when it is the most convenient for them. Verbal clues are missing in CMAC which can support and ease the understanding, or it can interfere with it. All in all, CMAC seems to be an effective way of problem solving, knowing more perspectives, giving and getting feedback, and closing open questions without waiting for meetings (Berry 2011).

Generally, the most conspicuous part of communication as a challenge in virtual teams is the lack of nonverbal communication. Communication without facial expressions, body language, or eye contact makes the job of the communicating parties less easy. Especially, that according to Chhay et al. (2013), 80% of the whole communication is nonverbal. Based on the research of AIM Strategies (2010), the lack of visual cues increases miscommunication and inconsistent expectations. This gap of nonverbal clues needs to be fulfilled by proper managerial communication style and methods. Also, frequent calls and video-audio tools for online meeting can help in addition to email and other nonverbal communications (Chhay et al. 2013).

In addition, the absence of face-to-face communication, the conversations via phone and partly the lack of trust and lack of cultural understanding often create conflicts. When a problem emerges in virtual teams, one cannot go to the other colleague's desk and discuss that. However, surprisingly, most virtual members believe that confronting conflict is essential for successful performance and only minor participants decide next to avoidance with not responding to emails and calls. For conflict handling, the most popular tool is the telephone. While calls are effective, there are even more useful tools today, for example video conferencing software, as mentioned earlier already, which can broadcast facial expressions too (AIM Strategies 2010).

Another communication barrier lies in the common language that is usually English. However, English is often not the native language of the project members. Complications can emerge from interpretations of the same words in different countries or from various competency levels. For example, the words 'yes' or 'done' might be understood differently by people from different cultures. Interestingly, accents are not mentioned as important points of stress (AIM Strategies 2010). These burdens can be eased by more face-to-face meetings or the employment of a knowledge manager who extracts information to the new colleagues (Brandel, 2006). Also mentoring programs, or special knowledge repository can help new members in understanding established, but not evident knowledge and specific expressions typical in the different members' countries.

In conclusion, communication is related to all the herein below discussed virtual challenges in one or another way. Communicational barriers include complications with the common language, misinterpretations due to cultural differences, difficulties with information flow within a fast project environment. To add more, multitasking and feeling of isolation can be created due to the lack of face-to-face communications, just to mention a few. In general, the usage of audio-visual solutions and as frequent as possible face-to-face meetings can help effective communication in project management.

2.4.2. Isolation and confusion

Another well-known challenge in virtual project management is the overcoming the feeling of isolation. Virtual team members are separated from their project members and they often miss he hallway chats and the personal interaction in general. Researchers show that interactions among co-workers motivate employees and make them more satisfied. However, Kirkman et al. (2002) do not support those findings. He states that individuals feel isolated, but others enjoy independent, virtual work. In addition, some employees like that without social interactions, gossiping or political arguments can be avoided. Also, for some participants meeting with partners and customers is satisfying and enough for them (Kirkman et al. 2002).

In order to relieve the feeling of isolation, a nice solution might be to ask employees whether they want to work in a virtual team or not. By all means, personal meetings, special events, or team buildings decrease the feeling of detachment (Kirkman et al. 2002). Nonetheless, face-to-face occasions are not always necessary. Some well performing teams have never met (AIM Strategies 2010). The contribution of virtual project managers to solve these difficulties is stressed. They need to communicate frequently with their team members via phone or audio-visual programs to lessen the perception of isolation (Kirkman et al. 2002). Unfortunately, really few teams use video technologies to overcome isolation. While the teams that do, reported that meetings with video improved communication and helped them building relationships (AIM Strategies 2010). Project managers also have to communicate openly, clearly and in a calm manner because panic and bad feelings are enhanced in isolation. Managers need to recognize that virtual team members have human needs for belonging and accomplishment, recognition, and that they can be frustrated or angry just like anybody else. These necessities and negative feelings need to be talked about. Thus, empathy from the project manager and meeting individually with the members, not only in group, are very important (Brake 2006). Another advice from Malhotra et al. (2007) for project managers in relation to isolation is that members need to believe that they personally benefit from this work. For this, managers can organise virtual reward ceremonies where the gifts are delivered to the location of the receiver or a simpler solution is to start project meetings recognition of individual successes (Malhotra et al. 2007).

Confusion is another problem often occurring in virtual teams. Firstly, virtual members often work on more projects in parallel, moreover, they have many obligations that lead to continuous multitasking (AIM Strategies 2010). There are many uncertain factors in a virtual team creating stronger need for focus, alignment, clear team roles and responsibilities. Clear objectives and project purpose have to be told by the project manager to all members, so everyone can work consistently toward the final aim. Furthermore, for good performance, cohesion and focused energy are needed.

It is important to note that as the project goes on and it might change, responsibilities and roles can change too, thus regular updates of those are essential. Furthermore, collecting and sharing knowledge in operating agreements serve as common reference points and they are useful tools to decrease confusion. Operating agreements are common reference base of knowledge. Popular tools like decision level matrixes or workflow tools can be fruitful as well (Brake 2006).

2.4.3. Developing trust

Building trust is another excessive challenge in virtual teams. The characteristics of virtual teams such as time difference, cultural diversity, distance and the reliance on computer mediated technology have negative influence on trust, in general. However, the theory of swift indicates the research questions of whether trust can be created and how it can be done so, are not the right questions to ask. Instead, the following question would be more fitting: "from where is trust imported to the global virtual team and how is trust maintained via electronic communication?" (Jarvenpaa 1998, p. 169). Swift trust is focusing on social structures and actions because members initially assume trust and they do not develop that (Jarvenpaa 1998). In line of Jarvenpaa's (1998) theory, Kirkman et al. (2002) also question the traditional aspect of trust building which claims that frequent face-to-face interaction cannot be missed. According to Kirkman et al, there are two kinds of trust. The conventional one is called ability-based or task based trust which is created during personal interactions. While the benevolent or interpersonal trust is developed when important information is kept confidential. It requires consistency, quick responses and reliable performance from team members. Thus, interpersonal trust can be built virtually without face-to-face interaction (Kirkman et al. 2002). The study of AIM Strategies (2010) supported this belief as they said that trust was strengthened by regular contact, honesty, commitment and did not require face-to-face communication. To secure the creation of benevolent trust, team leaders should encourage team members to reply as fast as possible and go through with their commitments all the time (Kirman et al. 2002).

In addition, trust is especially meaningful at the beginning of a project. In this phase, communication is directly connected to trust formation as it has an essential "getting to know you" (Brake 2006, p. 118) element. The team needs to connect and then collaborate. Members need to feel that they bring value to the project and they are acknowledged for it. Early communication sets the tone of the atmosphere for the whole project life cycle. In order to avoid isolation and alienation, it is suggested to organise a face-to-face meeting as close as possible to the start. If a personal meeting is not possible, sharing pictures and introduction of professional experience can help in getting to know each other and feeling of proximity as well. Last but not least, the enthusiasm and optimism of the leader are fundamental for building trust in a virtual team (Brake 2006).

2.4.4. Performance, diversity and virtual meetings

An all-round challenge for virtual project managers is performance measurement and managing people who are out of sight in general. In conventional teams, project leaders can see where members need some support, and in which field they are strong. However, in a virtual team, monitoring and measuring productivity might be problematic. By contrast, Kirkman et al. (2002) introduce a complex, multi-layered assessment process that diminishes the difficulties of virtual performance management. The assessment process includes quarterly customer satisfaction surveys in which clients share their experience with virtual teams' performance. Then customer service scores are posted on the intranet of the company. The measured characteristics are objective and less receptive to stereotyping, discrimination or any other biases. Customers' opinions give managers a subjective, external evaluation of their team and managers can regard customers' judgement at rewarding. Contrary to the general belief, evaluation of virtual team members might be even more accurate than in traditional teams. The reasons behind this is that everything is documented virtually, thus can be followed back, and basically there are no biases, as mentioned above (Kirkman et al. 2002).

The diverse backgrounds of virtual team members and stakeholders make the job of project managers harder. Diversity can appear in professions, interests, decision making styles, or anything else. For successful team performance, diversity needs to be understood and managed properly. In order to understand diversity, according to Malhotra et al. (2007), a standard way virtual project managers follow is the creation of an "experise directory" (Malhotra et al. 2007, p. 63). The catalogue should include photos and biography of team members. Another helpful tool might be a skills matrix of the participants. These materials can aid the members getting to know each other's competencies and working styles better. As well as it helps the project managers in task allocation and in the creation of special working pairs within the team which would not be possible in a co-located team (Malhotra et al. 2007).

In virtual teams, meetings are more important than in face-to-face teams. Meetings serve as ways to keep members updated and interested about the project and their duties. In spite of that, virtual meetings often get off the planned track because participants are not sitting together, so they can lose attention easier. In order to avoid losing attention, project managers need to ensure that meetings have clear, written agendas and that members are not multitasking during the sessions. Some leaders make members show their attention during meetings with online tools, for instance participants need to vote online. For a focused virtual meeting, managers need to plan and bring off the meeting by following a strict choreography. The practices of Malhotra et al. (2007) start a few days earlier than the meeting. He suggests that draft documents should be posted into the virtual workspace of the team in order

that comments and questions can be discussed in advance. This way, during the meeting only the unanswered and more complicated queries need to be talked over. At the beginning of the meeting, it is advised to connect the team members personally, for example with sharing personal stories that happened recently. For the closure of the meeting, allocation of required actions and posting of those to the team directory are practical. Thereby, members become committed toward the next project step (Malhotra et al. 2007).

2.4.5. Free riding

The phenomenon of free riding is not unknown in conventional project teams, however, due to the different geographical locations, the various cultural aspects, and because, as analysed above, the measurement and supervision of virtual teams require distinct management techniques, the occurance of free riding is more probable in virtual teams. The diversity and the lack of personal relationships within the virtual team members might result in a more self-advocate attitude of participants. In any projects, there are always achievable benefits like bonuses, or promotions, but a price always have to be paid for those. Consequently, a rational member might be motivated to free ride, and to pass the responsibility and the tasks toward other team members. The reaction and reporting of free riding are even more unexpectable in a virtual team. However, free riding always creates conflicts within the team, thus the managerial implications are essential. Managers need to monitor the individual task fulfilments, and the performance of the group also in order to avoid free riders. Also, a channel for reporting free riders has to be established and acquainted for the team members (Amir, 2010).

2.4.6. Cultural differences

Virtual teams usually consist of several nations with different the traditions, cultures and habits. Cultural differences include various conversation and relationship building styles as well. For example, team mates from Asia, especially in China or Korea initiate relationship building early on, while members from the US or Europe prefer focusing on the goals, and later on partnerships might become friendships (AIM Strategies 2010). However, as Chhay et al. (2013) emphasize, cultural diversity has its positive effects next to the burdens. “Value in diversity comes from increased creativity, innovation and flexibility,” while “negative aspects of team diversity include communication difficulties, misunderstandings, decreased cohesion and increased conflict” (Chhay et al. 2013, p. 29). In order to avoid conflicts and develop relationships, cultural awareness is indispensable (AIM Strategies 2010). Therefore, cultural sensitivity trainings can be efficient methods to develop respectful and clear communication within the team (Chhay et al. 2013).

In Table 2., 5 concerns to remember in multicultural teams collected by Target Training are listed.

1.	Culture has an impact on the way of working. In mono-cultural communities status, punctuality, methods, relationships and courtesy are evident and interpreted in the same way. In mixed cultural teams the project managers are responsible for calling attention to differences and they have to stand as an example in respect those, not judge.
2.	"Some cultures say time is money, others say relationship is money" (Target Training, p. 12). Project managers have to leave time for small-talk.
3.	In some cultures, status is more important. In virtual meetings status cannot really be highlighted and some members might find it disturbing.
4.	Requirements and tasks have to be double-checked to ensure what has been discussed and is the same what the manager thinks has been agreed.
5.	Project managers need to be patient with the members who do not speak the common language properly.

Table 2.: 5 concerns to remember in multicultural teams (Target Training)

2.4.7. Time zones

"Working around the clock" (AIM Strategies 2010, p. 7) is a regular challenge in virtual teams since members work in variant time zones. The acclaimed advantage of utilising time the most in 24/7 is not effortless at all. To be able to hold meetings, colleagues often schedule calls and conferences before or after their official working hours. This requires better synchronization and coordination from the project manager. Also, work-life balance of virtual members can be disturbed by the unusual schedules which has to be recognized and managed carefully by the project leader (AIM Strategies 2010).

2.4.8. Summary of advantages and challenges from reviewed literature

In Table 3., the advantages and challenges in the project management of virtual teams identified by the reviewed academic studies are listed.

Advantages	**Challenges**
Flexibility	Lack of nonverbal communication
Capability	Lack of trust
Responsiveness	Using a common, foreign language
Cease time and space being obstacles	Feeling of isolation
Following the Sun	Confusion
Employees working in multiple teams	Lack of trust
Automatical documentation	Monitoring virtual performance measurement
Working from home office	Diverse background of members
The bests can be hired	Management of virtual meetings
	Free riding
	Cultural differences

	Time zones

Table 3.: Advantages and challenges in the project management of virtual teams identified by reviewed studies

As represented in Table 3., previous academic studies have identified more advantages than challenges in the project management of virtual teams. In addition, the challenges of virtual project management have been examined more thoroughly, and have been exemplified with more precedents than the advantages. On the contrary, this master's thesis aims to research both the advantages and the challenges at an equal weighting. The academically identified advantages and challenges of virtual project management are going to be compared with the perceived advantages and challenges gained by the research of this master's thesis. In the followings, in order to ease the emerging challenges in virtual project management, cloud computing is going to be introduced.

2.5. Cloud computing

The introduction of the evolution, as well as the positive and characteristics of virtual project management unfolded that developments in this new working form are still necessary. Next to the suggested project management practices, the described challenges can be eased by the usage of new technology. A relatively newly developed computer technology called cloud computing might bring unimagined support in virtual communication and collaboration.

2.5.1. Cloud computing in general

The birth and growth of cloud computing is closely related to the outsourcing of IT (Chou 2015). In parallel with IT outsourcing, virtual teams started to emerge, since companies had more locations with far-flung colleagues working together. Originating from its complex nature, the novelty of the phenomena, and that it is still evolving, a genuinely accepted definition for cloud computing does not exist (Wang et al. 2010). Cloud computing is often referred as a technology, while it is more like a way of getting access to, and consuming IT. Cloud computing is made of several technologies which together create the cloud model, such as broadband, automation and virtualisation (BISL 2012). The word cloud is an acronym for "common location independent, on-line utility on demand" (Cervone 2010, p. 164). While, according to Griffith (2016), "The cloud is just a metaphor for the Internet. It goes back to the days of flowcharts and presentations that would represent the gigantic server-farm infrastructure of the Internet as nothing but a puffy, white cumulonimbus cloud, accepting connections and doling out information as it floats."

For a more precise understanding of cloud computing, two definitions have been chosen out of many. David C. Chou (2015, p. 73) says "Cloud computing is a recently developed information technology (IT) that utilizes resources virtualization approach to deliver IT services through Internet technology

and on-demand mode." While Peter Mell from the National Institute of Standards and Technology (U.S. Department of Commerce) (Mell et al. 2011, p. 2) states: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Additionally, some cloud computing services are listed in the followings. First of all, the more well-known ones as Live Hotmail by Microsoft, Gmail by Google, the search engine of Google, and all the social networks like Facebook, or Twitter. On the other end of the table, there are niche cloud services such as Zynga that is an online gaming service, or Wikileaks where leaked corporate, or governmental documents can be found and commented. These listed services are free of charge, but there is several paid-for business-IT services available on the market by Amazon, or Google, to mention a few leading ones (BISL 2012).

Related to cloud computing, there are four existing service models. First, Hardware as a Service (HaaS) that was the first step toward cloud computing. In HaaS users can buy, or rent IT hardware, or data centre from an independent company (Wang et al. 2010). In Software as a Service (SaaS) customers can run applications of the service provider via cloud system. Platform as a Service (PaaS) is one of the latest cloud service models. In PaaS model, consumers can program their own applications, or customize the available programs of the provider. In PaaS, the user does not have access to the 'back office', unlike in Infrastructure as a Service (IaaS). In IaaS, users have access to almost everything, for instance they can operate the storage, the application, the network, except from the cloud infrastructure which is programmed and maintained only by the service provider (Mell et al. 2011).

Furthermore, cloud computing can be categorised into four deployment models. The private cloud is the most secure where data privacy is the main concern. However, as only one customer uses the whole system, the client has to pay the setting up and the maintenance costs all alone. As an other option, the public cloud which is probably the most popular model is the least secure. In a public cloud, services are available to anyone via the Internet. The owner of the public cloud shares all information with the general public. The positive side of this is the popularity, thus it might be a good choice for clients looking for great publicity. The next deployment model is the hybrid cloud which might be a comfortable solution for consumers with mixed type of data. In a hybrid cloud, more valuable data is stored on a local server, while the less sensitive materials are stored in the cloud. Lastly, a partly private solution is a community cloud where a group of clients with similar IT requirements share the same infrastructure provided by the same supplier. In this model, the costs are

shared amongst the users. Partly private models are more secure because the shared data is only available for the members of the communities buying the service together (BISL 2012) (Mell et al. 2011).

2.5.2. Advantages and disadvantages of cloud computing

Firstly, the most obvious advantage of cloud computing lies in its fundamental characteristic, the access to resources. Cloud computing makes possible to reach and use powerful remote computers and huge data warehouses resulting in higher computation speed and larger storage capacity comparing to most organisations own IT infrastructure. The next gain is mobility that makes users able to access cloud services from anywhere with Internet availability. In addition, easy scalability let consumers pay a monthly fee or use a 'pas as you use' model which are again favourable for the company budget. Furthermore, the client can outsource the responsibility for support and maintenance of the cloud services. The service supplier usually offer ongoing support and can run backups and updates automatically, without even bothering the users. To add more, cloud computing is often referred as the 'green' IT solution. The reason behind is that in-house servers usually run at around 5 % capacity which represents the peak demand. In contrast, large data servers, cloud servers run at around 80 % capacity, while the consumed energy is almost the same amount as the consumption of the smaller, in-house servers (BISL 2012).

Lastly, as partially mentioned already, one of the biggest advantage of cloud computing is cost reduction. Today, IT infrastructure is crucial. Costs relating to IT represent one of the most significant expenditures, thus financial savings in this field are highlighted. Next to the described preferential paying systems, renting cloud services reduces the necessary internal IT professionals and assets. All in all, IT operation costs are lowered, just as business risks and maintenance costs. Also, since cloud computing does not belong to capital expenditures, in case of a switch between service providers, customers lose less (BISL 2012) (Kelly et al. 2012).

Although, there are less disadvantages than advantages, those are quite important. Three main fields are stressed on the negative side of cloud computing which are Internet reliability, dependence on the supplier and the question of data security. Clearly, IT cloud services are transmitted through the Internet, thus stabile and fast connections are required, preferably broadband connection. Addinitionally, continuous dependence on the cloud service provider is another huge risk. This risk does not only include maintenance and support, but the day-to-day availability of the paid service. For example, if the supplier has financial problems, the offered services might be negatively influenced (BISL 2012).

Probably the greatest concern in cloud computing is data security that has several aspects to be considered. On the one hand, a great advantage is that the users does not need to know about the physical hardware, they are really only on the user side. On the other hand, it is a great risk, because the remote computers can be located anywhere, but usually in foreign countries with cheap real estate, labor and utilities. However, each countries' regulations are different and the physical servers are subjects to the local laws. If the customers do not know the host country, they cannot know the regulations they become indirectly subject to (Cervone 2010). Also, cloud providers are legally obliged to cooperate with the authorities of the host countries. They can even be forced to disclose information about their clients' activities and data, often in secrecy (Nanavati et al. 2014). Moreover, most of the cloud providers are not commited to transparency, and they do not enclose information about the host countries and their regulations for the customer (Cervone 2010). Furthermore, in case of a not properly protected server, both virtually and physically, data leakage or data loss can have a painful impact on the data owner. However, data protection is a great challenge in cloud computing. There are acclaimed and used methods such as authorization, access control, and authentication of the data stored in cloud, but these securities need to be properly implemented which is a very difficult task, and still, it is not 100 % security against being hacked. But even if there is no loss or leakage of data, the operator of the cloud have access to the uploaded data, so there is the question of confidentiality toward the service supplier (Rao et al. 2015). As a recent solution for the problem of confidentiality, cloud service providers have started to get engage with compliance and security certifications, in order to reassure customers for their reliability (Nanavati et al. 2014).

All in all, it can be stated that challenges in the project management of virtual teams have already been researched and published extensively. However, no academic research studies have been found amongst the reviewed literature with the same research methodology as in this master's thesis, or with the same research purpose. No previous studies reviewed focused on the discipline of virtual project management and its challenges supplemented with cloud computing. Furthermore, as mentioned in chapter 2.3. (Advantages of virtual teams, and of virtual project management), this master's thesis do not solely research the challenges lying in the project management of virtual teams, but the advantages as well, not preferring one over the other. Thus, all these strengthen that a further qualitative study in the field of virtual project management and its characteristics is still relevant.

2.6. Previous studies related to cloud computing and virtual project management

This thesis considers research studies conducted by Xin (2015), IBM (2014), Forbes (2013), SEC (2012) as these are of particular interest in terms of revealing the previous studies in relation to the intersection of virtual project management and cloud computing. As mentioned in the introductory

phase of the theoretical framework, after thorough research, it can be stated that there is indeed a not yet examined subject regarding the supportive function of cloud computing in virtual project management. Xin (2015), IBM (2014), Forbes (2013), and SEC (2012) have studied the effectiveness of cloud computing in different environments, and the experience of different users with cloud computing tools which serve as informative and inspiring basis for this research. Relevant findings of the herein below introduced analyses can stand as comparative base for this study.

In 2015, Xin (2015) was researching user acceptance of Google Docs as collaboration tool. Google Docs is one of the most well-known online file management system operating based on cloud technology (Xin 2015). Google Docs can be regarded as a good example of the acceptance of cloud collaboration tool usage in general, because anybody who has an email account by Google, also known as Gmail account, can access and use Google Docs. It is interesting to note that in February 2016, 1000 million people have had access to Google Docs all around the world (Statista 2016).

The research model of Xin (2015) was based on the Expectation Confirmation Model (ECM). Google Docs were chosen because it has been one of the best known cloud collaboration tool globally (Xin 2015). With Google Docs, users can easily share documents, store files in the cloud of Google, edit online documents, create online presentations, even simultaneously with another editor. The aim of Xin's (2015) study was to help users and academicians understand about the acceptance of SaaS tools. The subjects of the research were 130 MBA students at a university of North-Eastern USA. Their task was to prepare a research paper in Google Document word processor, then present their findings with Google Presentation (Xin 2015).

As a result, the data from the 130 cases supported all, but one hypothesis, H3 which claims that "perceived usefulness has no direct impact on user's satisfaction with using SaaS collaboration tools for team projects" (Xin 2015, p. 437). The reason behind this might be that 85 out of 130 participants had weak or no prior experience with Google Docs (Xin 2015). From the findings of Xin (2015) the last two hypotheses, H6 and H7 can be considered as relevant in respect of this research. According to these results, previous experience and IT skills of the users have strong influence on the relationship amongst perceived usefulness, satisfaction, confirmation, and intention to continue using SaaS cloud computing tools (Xin 2015). In reflection to this thesis, by Xin's (2015) research, new insights have been given to the empirical research of this paper. As a result, this master's thesis is going to study the connection between previous IT knowledge of team members and their willingness, motivation to use cloud computing tools as well. In addition, the research of Xin (2015) helps exploring the current academic data about cloud computing in order to be able to properly synthesize the results of this thesis to the theoretical framework. Overall, Xin's (2015) study is one of the few preceding

academic works dealing with the segment where the meeting of cloud computing and team performance are examined which is considered important regarding the fact that the research fields are cloud computing and project management of virtual teams where team performance is determining as well.

In the study conducted by IBM (2014), the connection between adopting cloud computing technologies and competitive advantage was investigated. The advantages of virtual project management gained by cloud computing adoption are researched in this thesis which are often building blocks of competitive advantage examined in the study of IBM (2014). Thus, this thesis aims to identify the connections between cloud computing and the components of competitive advantage, while the survey of IBM (2014) aimed to reveal the relationship between cloud computing and competitive advantage itself. Therefore, the study of IBM (2014) is considered relevant to be integrated in the theoretical framework of this thesis.

In general, cost savings stand as the main reason when businesses turn to cloud computing. Nevertheless, first adopters of cloud computing started to discover other possibilities in the cloud for example competitive differentiation. In the interest of benefitting from cloud as competitive advantage, in 2013, a research of IBM Center for Applied Insights studied how organisations used cloud computing to achieve competitive advantage. That research was the inspiration for IBM Corporation to further examine the topic. Thus, in 2014, IBM Corporation conducted a global analysis amongst companies that were already using SaaS. 879 decision makers were surveyed including higher level IT executives, directors, Vice Presidents and managers both from business and IT fields. 20 % of the respondents worked in companies with 10000 or more employees, while 40 % were from enterprises with less than 2500 employees. The study consisted of three groups of the respondents. The first group included the pacesetters who invested and adopted SaaS the most and already gained competitive advantage thanks to their efforts in cloud computing. The second group represented the challengers who adopted SaaS in a smaller extent, but still gained competitive advantage via SaaS implementation. The third group contained the chasers who were the slow adopters of SaaS and did not gain much competitive differentiation through SaaS. One of the main difference between pacesetters and the others was the reason why they decided to use SaaS. The chasers and challengers usually preferred cloud computing due to the possible reduction in total cost of ownership and the development in application speed. In contrast, pacesetters aimed to improve collaboration and customer experience by SaaS (IBM 2014).

The four main categories, research statements and results if IBM (2014) are represented in Table 4.

		Chasers	Challengers	Pacesetters	% Pacesetters surpass Chasers
Enterprise efficiency	Increased self-service capability for applications	26%	36%	74%	+185%
	Optimized business processes and workflows	31%	41%	66%	+136%
	Improved applications agility (flexibility deploying and implementing solutions)	28%	41%	66%	+136%
Deeper collaborations	Increased collaboration across organisation and ecosystem	34%	37%	61%	+79%
	Improved core business relationships	28%	44%	71%	+154%
Better decision making	Leveraged analytics across organisation to turn big data into insights	34%	50%	72%	+112%
	Achieved better decision making	28%	41%	72%	+157%
Market agility	Increased innovation	29%	40%	66%	+128%
	Reduced time to market entry	30%	42%	71%	+137%
	Improved customer experience	30%	47%	68%	+127%
	Changed organisation's business model	30%	44%	71%	+137%

Table 4.: SaaS and competitive advantage (% achieving through SaaS) (IBM 2014, p. 11)

In conclusion, as the results show, in every examined question the pacesetters outperformed the chasers and the challengers. In addition, there was not a single case in which the chasers would have performed better than the challengers, or the challengers better than the pacesetters. This indicates that the extent of SaaS implementation and usage matters as the more engaged a company is in cloud computing, the more gain it can earn. All in all, IBM's (2014) study proved that adoption and usage of cloud collaboration tools can support in many more benefits than cost savings. According to the examined study, SaaS tools positively influence efficiency, collaboration, decision making and market agility (IBM 2014). Some findings of IBM, especially the influences of cloud computing technologies on better decision making, and on more effective collaboration are considered valuable

regarding the research purpose of this thesis. Due to the mentioned results from the study of IBM (2014), the correlation among the usage and adoption of cloud computing tools, more effective collaboration, and enhanced business processes are going to be researched in this thesis. Then the gained data is going to be compared with the results of IBM (2014). Finally, the study of IBM (2014) is considered inspiring and enlightening since their research fields of cloud computing and competitive advantage are related to the research areas of this thesis.

The following corporate report by Forbes Insights (2013) studied business value and effectiveness via cloud computing. Since one of the research purposes is to reveal how cloud computing tools can support virtual project management, the study of Forbes (2013) examining the effectiveness of cloud computing is closely related to this master's thesis. Forbes Insights conducted a research for the company Cisco in 2012, including surveys and interviews in which 532 executives from Asia-Pacific, Europe, Middle East, Africa and North America were asked about their usage and opinion of cloud computing tools. The turnover of the affected companies ranged from $299 million and more than $20 billion. Furthermore, several industries were covered such as energy and natural resources; government; retail; healthcare; technology, media, telecommunications; manufacturing and financial services (Forbes 2013).

In the survey of Forbes (2013), participants had to answer whether they do or do not use cloud computing tools for different activities, for example for holding video meetings or collaborating with external organisations. Based on the results, respondents were categories into five groups: leaders, followers, early majority, late majority, laggards. Leaders (14%) used cloud computing for 10 or more imperatives. Followers (19%) used cloud tools for 6-9 tasks. Early majority (34%) relied on cloud collaboration for 3-5 activities, while late majority (21%) used cloud computing tools for only 1-2 imperatives. Finally, laggards (11%) did not have any intention of using cloud collaboration tools. This differentiation is reflected in the other parts of the survey as leaders were significantly more positive about the recognized and future value of cloud computing compared to laggards. The results are introduced on Figure 1. below (Forbes 2013).

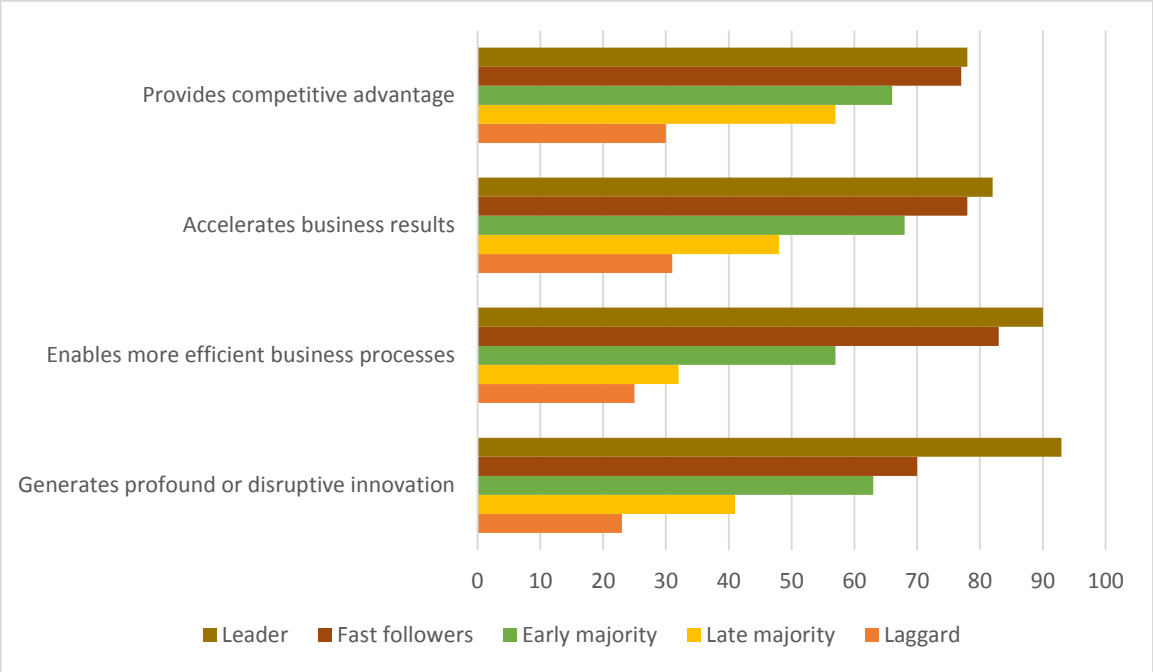

Figure 1.: Experience with cloud-based collaboration correlating with perceived value (Forbes 2013, p. 5)

To summarize, the results of Forbes Insights show that collaboration through the cloud strongly fosters innovation, enhances effectiveness of business processes, increases business results and contributes to competitive advantage (Forbes 2013). The results of the Forbes study, just as in case of the study of IBM, explored a strong correlation among the usage of cloud computing tools and better business processes, enhanced business results and stronger competitive advantage. Indirectly, all these elements relate to the research purpose that how cloud computing can support the perceived challenges in virtual project management. Especially that, as chapter 2.3. (Challenges in virtual project management) describes, problems of virtual project management relate to the performance and overall effectiveness of the virtual team as well. The results of Forbes (2013) have influence on the research directions of this thesis. Due to Forbes' (2013) findings, the correlation between the usage of cloud computing tools and enhanced business processes are going to be examined in this thesis. Then the gained data of this thesis is going to be compared with the results of Forbes (2013). Finally, the research of Forbes Insight (2013) is one of the few studies from the previous academic literature in the field discussing cloud computing and its effects on business operation, thus this paper helps widening the perspective of this research thesis as well.

Another research, which is not academic but corporate source, can be considered as the most similar study to this master's thesis. The study of Siemens Enterprise Communications (SEC) targeted to measure the kind of collaboration tools used, and to obtain information about the perceived effectiveness of cloud computing tools in virtual teams (SEC 2012). Thus, it is directly related to the second research question of this thesis.

SEC is a global cloud service provider that offers unified communication and network infrastructure solutions for their customers. SEC performed an online research survey generated between September and October 2012 (SEC 2012). 320 respondents from 9 countries from Latin America, North America and Western Europe filled the questionnaire.

SEC (2012) found that 43 % of their respondents are not satisfied with their current collaboration tools. For this reason, questions about the satisfaction of the target group of this master's thesis are going to be implemented during data generation in order to gain a comparative basis. In addition, SEC (2012) found as a result that even though telephone and email are the most frequently used collaboration tools, only 54% of the surveyed consider those suitable. This interesting result is going to be approached during the data generation of this thesis in order to be able to compare the results. Furthermore, the survey of SEC (2012) resulted in another informative fact about the audio-video tool usage. Their results said that while two thirds of the respondents believed in the supporting function of video tools, only one third used them in their work. Again, this result of SEC (2012) is going to be approached in the data generation of this master's thesis, in order to test if the here gained results and of SEC's (2012) are the same and if so, why. Another finding of SEC (2012) indicated that 75% of the respondents find virtual teams confusing and upsetting which is directly related to the researched advantages and challenges of virtual project management. Thus, this result of SEC is considered as a comparable finding to the further results of this thesis. Lastly, according to SEC (2012) only 8 % of the asked businesses believe they have processes supporting team performance management. This last research direction of SEC (2012) is going to be indirectly researched in this thesis, since this thesis focuses on whether business processes based on cloud computing result in enhanced team performance management.

To sum up their results, 79 % of the responders are frequent participants in virtual team work, however, 44 % consider a conventional team more productive than a virtual one. The study found that virtual team members believe they do not have the necessary toolbar for an efficient virtual collaboration, and that their actual tools are improper (SEC 2012). All findings of SEC (2012) are directly related to the research purpose of revealing the supporting function of cloud collaboration tools in virtual teams. Thus, the findings of SEC (2012) are going to be approached in the data generation of this thesis in order to gain a comparative base. Even though SEC (2012) is not an academic source, their findings are unique, and are considered as the initiation and comparison base for this master's thesis.

In summary, the above introduced studies confirm the research gap of the cross-section of virtual project management and cloud computing in the academic cyclorama. No previous, academic studies

have the same research purpose as of this master's thesis. Therefore, further research in the field of virtual project management and how cloud computing collaboration tools can support the emerging virtual project management challenges is considered relevant.

2.7. Synthesizing the theoretical framework

All in all, it can be stated that the first research question concerning the perceived advantages and challenges in the project management of virtual teams have been studied before. However, regarding the fact that advantages are less discussed in previous academic materials, and also due to the extensity of the subject, a comparative study is still considered relevant. Thus, the first research question is going to be answered by the analysis and the comparison of the herein below researched empirical data with the previously identified advantages and challenges of virtual teams introduced in chapters 2.2., 2.3., and 2.4. of the theoretical framework.

The second research question focusing on how cloud computing tools can support the project management of virtual teams has not yet entirely been studied earlier. Thus, the reviewed literatures can serve as initial points. The read and discussed materials can widen the understanding of the field of this thesis. Nevertheless, the following findings are considered the most relevant and informative regarding the second research purpose of this thesis and they are going to be approached in the empirical research of this thesis. In particular, two research findings by Xin (2015), who studied prior experience with cloud computing and IT skills of the users, are relevant for this paper. His results indicate that the experience with SaaS tools, and the computer skills of the users influence the satisfaction, the perceived usefulness and the intention to continue working with cloud tools (Xin 2015). IBM (2014), nevertheless, identified positive correlations between cloud computing tools and more effective collaboration, and also between cloud computing tools and better decision making. These findings are in indirect correlation with the second research question of this thesis. Based on the study of Forbes Insights, the most significant result for this thesis is the fact that cloud collaboration tools enhance business processes (Forbes 2013). Lastly, the survey of Siemens Enterprise Communication has the closest relation with this master's thesis, and most of its findings are considered relevant for the research question aiming to determine the supportive functions of cloud collaboration tools in virtual teams. According to SEC, a significant amount of virtual team members are not satisfied with their available collaboration tools. In addition, many employees in virtual teams consider telephone and email as insufficient, even though these are the most frequently used tools. Furthermore, audio video tools are thought to be useful by two thirds of the respondents, however, only one third use these options in real life (SEC 2012). The above discussed findings of the four introduced studies about cloud collaboration tools and virtual project management are going

to be regarded as departure points for the qualitative research of this thesis. The questions of the survey and the interviews are going to refer to these results in order to be able to give a comparative synthesis with the results of this study. (The questionnaire is visible as Appendix 1 and the questions of the interviews as Appendix 2.)

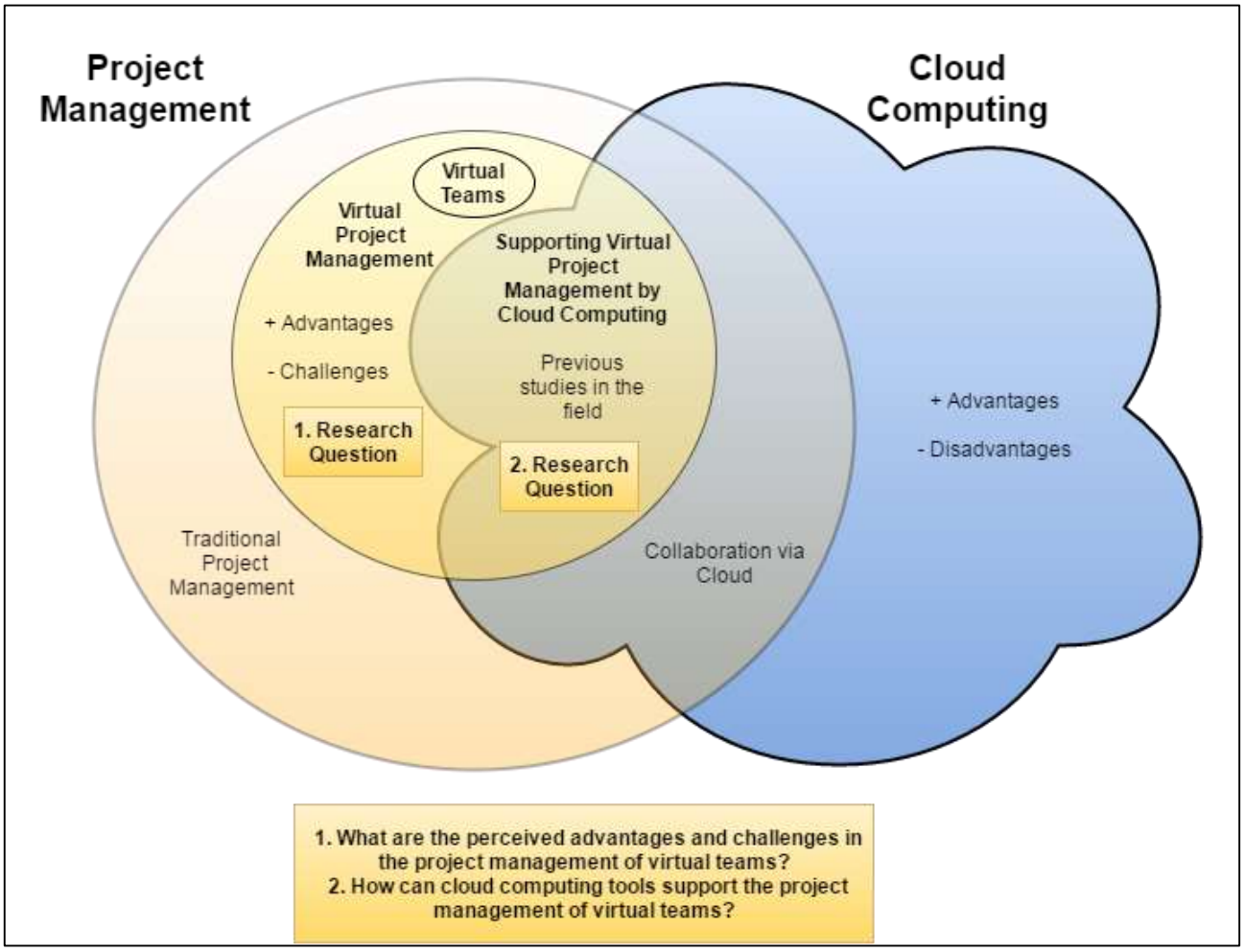

Figure 2.: Synthesis of the theoretical framework

The theoretical framework is illustrated on Figure 2. The two main disciplines of this research study are project management and cloud computing. At first, traditional project management and its turn toward new trends were discussed. Narrowing the subject, virtual teams and virtual project management were introduced. In relation to the first research question, the advantages and challenges identified by preceding studies were categorised and expounded. Then, turning to the other research area, cloud computing with its advantages and disadvantages were described. Finally, getting closer to the second research question, previous, directly or indirectly related studies about the intersection of virtual project management and cloud computing, more accurately, about the collaboration via cloud computing tools in virtual teams were revealed. The research methodology discussed herein below is closely built on the reviewed literature of the theoretical framework.

3. CONDUCTING THE RESEARCH

In this thesis, a qualitative business research (Eriksson et al. 2008) has been conducted in order to gain empirical data for answering the research questions about the perceived advantages and challenges in the project management of virtual teams, and about how cloud computing tools can support the project management of virtual teams. At first, in chapter 3.1. (Qualitative methodology), the general nature of qualitative data, common features of qualitative methodology, issues and limitations, as well as strengths of qualitative studies are going to be introduced. Further on, in chapter 3.2. (Research taxonomy, paradigm and strategy), different taxonomies of qualitative research then the chosen research strategy are going to be announced and explained. In chapter 3.3. (Ethical considerations), ethical considerations are going to be revealed. In chapter 3.4 (Data generation), the type and scope of data, the process of gathering data, the used tools, the problems and the limitations of the data collection, as well as the pertinence of the searched data are going to be described. Finally, in chapter 3.6. (Summary of the research process), the research methodology chapter is going to end with a summary of the research process.

3.1. Qualitative methodology

At the beginning of an academic research, the researcher has to decide about the methodology whether it is quantitative or qualitative. First of all, the field of an academic research is determinative. In this case, the field is management, more accurately virtual project management. The research field could not be disregarded during the process of deciding the type of methodology. In social sciences, including business research, qualitative methodology is the dominant choice (Eriksson et al. 2008). On the other hand, qualitative and quantitative methodology are not so easy to be separated. Miles et al. (1994) state that in some ways, there is no difference between qualitative and quantitative data since they both refer to characters of people, aspects of situations, or elements of objects. The only difference is that the gained experience is turned into words in qualitative, or into numbers in quantitative research. Nevertheless, given the research questions' explorative nature, a qualitative research methodology is regarded as more appropriate for this master's thesis.

One of the reasons behind the choice next to qualitative research methodology is that qualitative methodology makes possible to explore complex business-related phenomena in their own contexts (Eriksson et al. 2008). Contexts needs to be highlighted here because that cannot properly be presented in a solely quantitative research. Real-life business cases, real business environment, real business processes can, however, be thoroughly examined in qualitative research. In this thesis, virtual project management is a complex business-related phenomena and its own contexts are

widened with the effects and usage of cloud computing tools. Also, via qualitative business research, a critical and reflexive view of the business world and its processes can be formed (Eriksson et al. 2008). Furthermore, there is opportunity to explore a new area (Miles et al. 1994), such as the advantages and the challenges of virtual teams, of virtual project management, and to emerge a possibly new theory about it (Miles et al. 1994), such as whether and how cloud collaboration tools can ease virtual project management challenges. Next to these, a qualitative research can be designed to confirm or test an existing theory (Miles et al. 1994). This thesis does not particularly aim to confirm or test an existing theory, nevertheless, it tries to compare the empirical results of this research with some of the relevant results of previous studies. All in all, the research questions of this thesis aim to explore and identify new areas and connections, and do not aim to provide solely statistical data about for example popularity, or financial gain of implementing virtual project management for which quantitative methodology would be a better choice.

Recurring features of qualitative research by Miles et al. (1994) also stand by the choice of research methodology for the subject and approach of this master's thesis. First of all, qualitative research is driven in close contact with the business field or any other real life situation. In that contact, the researcher's role is to achieve an integrated, systemic, so called holistic view of the deeper context of the study. In order to get the overview, the researcher tries to catch the perceptions of 'insiders', real actors of the examined situation through focused attention and understanding toward the 'insiders'. As well, he or she tries to find assumptions and see logical connections about the researched topic. After collecting field data, the researcher sorts out some materials which needs to be reviewed, and some that can stay in their original forms. Then the examiner tries to expound the gained field data with the perceived background information and logical connections. In the interpretation phase of a qualitative study, the "main measurement device" (Miles et al. 1994, p. 7) of the study is the researcher itself. Finally, most qualitative analysis is done with words that are segmented according to the right way of presenting the results. The order of the words make possible to compare, analyse, and explore patterns in the findings (Miles et al. 1994). These features are concurrent with the steps and characteristics of the here needed methodology regarding the research questions and the original research notion of this thesis.

In order to emphasize even more the applicability of qualitative methodology in this research, the strengths of this type of method needs to be included. Probably the most relevant aspect of qualitative data is the focus, as partially mentioned earlier already, which is on ordinary events in their original, natural environment. Qualitative research is simply real. The second most important feature is the holism and abundance of qualitative data that contains the potential for exposing complexity with

impressive, vivid descriptions of real life. Last, but not least qualitative study suits well to identify meanings, assumptions, judgements people pair with processes, places, structures, etc. (Miles et al. 1994). All these characteristics of qualitative methodology are suitable for this research.

Nevertheless, each and every way of work has its less bright sides. So qualitative methodology has its issues too. Without the doubt, one of the most significant problem with qualitative study is unavoidable bias of the researcher. Qualitative analysis is based on the field experience and the interpretation of the researcher who is inevitably biased by his or her previous presumptions, knowledge and implicit concepts. To add more, for example if someone squeezing a fist and grimacing is described as angry that is indeed the own experience and feeling of the description giver (Miles et al. 1994). It is not easy to decide about what a real fact is. Gummesson (1993, p. 11) says "A so called fact is a combination of subjective values and raw data." The question is whether the subjective values and those interpretations by the researcher is the same as of the observed people or not. In all cases, the researcher's own values are very influential. Another difficulty with qualitative methodology is that the proper procession of field notes is problematic. The reason behind it is that the data collector decides which data is suitable or writable into an academic paper. In addition, even the difference in typing of a recorded interview can result in different final data. To say it another way, qualitative data is about actions, not behaviours. Some of these actions are straightforward and easy to be understand, while some people try to make a good impression on the researcher, so the action or situation might not completely be the same as it would look like in an ordinary day without the presence of an outsider. Thus while many consider qualitative methodology as the easy choice compared to quantitative research, it is really complex and it requires great amount of attention, understanding, and self-awareness from the researcher (Miles et al. 1994). Not leaving the negative sides of the chosen methodology ignored, the researcher of this thesis has tried being the least biased in her interpretations, in her questions, and in her judgements as possible.

3.2. Research taxonomy, paradigm and strategy

Qualitative research can be conducted in various ways. Several different approaches of qualitative methodology exist. For example, Jacob identified five major qualitative research traditions in 1987 which were symbolic interactionism, cognitive anthropology, ethnography of communication, holistic ethnography, and ecological psychology. Then in 1990, Tesch designed a tree that arrayed 27 types of qualitative research based on three questions which represent the main research purposes: "What are the characteristics of language itself? Can we discover regularities in human activities? Can we comprehend the meaning of a text or action?" (Miles et al. 1994, p. 5). In addition, in 1992, Wolcott created a tree which branches contained more than 20 strategies of data collecting in

qualitative methodology (Miles et al. 1994). Out of the introduced taxonomies, even though they are overlapping and this research could probably be put into more piles, Tesch's (1990) grouping is considered as the most suitable for this master's study. The interest of this study would be under hermeneutics originating from interpretation which is under the comprehension of the meaning of text/action (Miles et al. 1994). However, according to Miles et al. (1994), these categorisations might turn out as over complicated, and also they can become out-of-date quickly. The described taxonomies are informative and helped in the classification of the research interest, however, the perfect platform including the suitable research paradigms and strategy for this thesis was not found among them, but in the publications of Gummesson from 1993 and from 2005 who focuses on qualitative management research in particular.

Gummesson (1993) categorises scientific research paradigms into two groups: "the Hard Knights and the Soft Knights" (Gummesson 1993, p. 12). On the one hand, quantitative researchers follow the positivistic paradigm and insist on using measurements of the statistics and mathematics. They are the "Hard Knights", the "Knights of Hard Facts", or can be called the "Knights of Numbers". On the other hand, there are the "Knights of the Soft Facts", the "Knights of Words", or the "Knights of Impressions" (Gummesson 1993, p. 12) who follow the hermeneutic paradigm in qualitative research and prefer the methods where people's experiences are in the focus of attention and research. This thesis is definitely written by a Soft Knight who is committed toward the hermeneutic paradigm and "chase the understanding or Verstehen, a German word that has become accepted scientific jargon" (Gummesson 1993, p. 12). A "Knight of Words" wants to understand how and why, especially because of the field of the research is management where the aim is to understand, and a "Soft Knight" turn that newly gotten meaning to actions for better effectiveness and efficiency (Gummesson 1993, p. 12).

Furthermore, Gummesson writes about 15 strategies for qualitative analysis / interpretation in one of his articles called Qualitative research in marketing (2005). However, after thorough studying and consideration, the listed strategies are considered suitable for the field of management too. The listed fifteen strategies are the following: "Causality and understanding", "Simultaneity and data generation", "Comparison", "Condensing data", "Transparency" (Gummesson 2005, p. 312), "Techniques", "Computer Software", "Intuitive and experiential – but systematic and rigorous" (Gummesson 2005, p. 313), "All is data", "The hidden agenda", "The hermeneutic helix" (Gummesson 2005, p. 314), "Evaluation of sources", "Full report", "Alternative interpretations", "Privileged bias" (Gummesson 2005, p. 315). Gummesson calls these independent strategies, but some of those are sometimes overlapping, and it would be more appropriate to call these as strategic

approaches. Due to this, the mix of six strategic approaches are going to be considered as the leading strategy of this research. The guideline is causality and understanding referring to the primary characteristic of qualitative research such as understanding complex phenomena and not to form cause and effect connections of single variables. The next dominant approach is simultaneity and data generation indicating that in this qualitative research data collection, analysis, and interpretation take place in parallel, and that conclusions can be taken during the fieldwork, as well as from previous academic studies. In addition, the hidden agenda aspect is going to be implemented in the research strategy in a way that it is noted that the researcher's pre-understanding and paradigm can influence the interpretation and the hermeneutic processes. The next three strategic approaches bear only smaller emphasis on the overall strategy. In a broad sense, the researcher tries to consider all information as data, so that any feelings, observations, mimics, or motions can bring further meaning to the analysis. The comparison approach is going to be used for the comparison of some results from preceding studies included in the theoretical framework with the findings of this thesis. Lastly, partially the help of computer software, cloud applications are going to be used for the creation of data display (Gummesson 2005).

3.3. Ethical considerations

First of all, both the questionnaire survey and the interviews have been conducted via anonym participation. Two main reasons triggered this decision. First of all, this research aims to explore not only the advantages that are easy to talk about, but the difficulties as well. For some cultures, negative things are extremely difficult to share, even if not face-to-face, but via an online survey. Especially, if they do not know personally the recipient of their shared information. Additionally, the researcher wants to avoid non-disclosure agreements for several reasons. Firstly, probably it would not have been possible to reach four different companies, out of which two are huge multinational organisations where the contacted virtual members are in different parts of the word, thus belong to different organisational departments, and make them all agree to a non-disclosure contract. Also, the agreement process must have taken much of extra time for the bureaucratic steps. To add more, the author would like to make her thesis publicly available for the library of University of Tampere. Thus, for simplicity, more honest and reliable answers, as well as for the public availability of the thesis in the future, anonymity seems as a good and valid choice.

Further concerns toward ethics, at the documentation of the interviews, the interviewees were asked for their permission to record the conversation. After the interviews, the researcher typed and sent the text of the interview to the interviewees, and they had the possibility to indicate if everything is true to as the interview happened. Also, both the respondents to the questionnaire and the interviewees

were informed in advance that the gained data will only be used for the master's thesis of the researcher and no shared information is going to be published anywhere else, or in any other form.

Additionally, the author believes that the results of the thesis are going to be beneficiary. By answering to the research questions, especially the second one, how cloud collaboration tools can support virtual project management, new and useful practical information are going to be available for both the scientific community examining virtual project management and for all the participants of virtual project work who face difficulties in their virtual cooperation day by day. Also, in the last question of the survey, respondents had the chance to leave their email address in order to receive information about the findings of this study. 12 out of the 21 respondents gave their email addresses, thus showed interest in the results.

Also, the researcher tried to collect the participants of the survey and the interviews justly. The online notice that introduced the aim of the result and looked for virtual project teams to participate was posted publicly to social media. It means that anyone could see it, share it, or react to it. Thus, the fact that the researcher was acquainted with the participating virtual project managers is due to the limitations of social network connections and due to the approach of people who had the chance to share the posted notice with their own social network.

3.4. Data generation

First of all, Gummesson (2005) writes that the term of data generation is preferred to data collection because in case of a study conducted in a social environment, such as in the case of a business research, the data is not physically collectable object. Social or business data is generated because the researcher's work makes it into real information. For example in case of interviews, data is created during personal interactions, often unstructured interviews where the researcher finds the 'meaning between the lines', the correlations while the replies of the interviewees alone are not giving the searched information (Gummesson 2005).

Regarding data generation, Gummesson (1993) focuses on case studies. However, it is explained that Gummesson (1993) uses the term 'case study' widely. He provides a list of case study types which cover his understanding of case studies. The list includes the following kinds: "Explanatory cases", "Exploratory cases", "Descriptive cases", "Predictive cases", "Specific cases", "General cases", "Theory generating cases", "Theory testing cases", "Cases for initiating change", "Cases for integrative purposes", "Single case study", "Multiple case study", "Embedded cases", "Snapshot cases", "Cases of ongoing processes", and "Reconstructive cases" (Gummesson 1993, p. 8). The definitions of these types by Gummesson (1993) let this thesis be categorised as an exploratory case

study where exploring an area that is not yet well-known, or as an embedded case study where more cases are examined within a bigger case. Also, the usability of the methods and tools introduced in the book cannot be limited only for case studies in the traditional meaning. Thus, this justifies that this qualitative research can follow Gummesson's (1993) way of data generation and interpretation.

Gummesson (1993) presents existing material, questionnaire survey, qualitative interview, observation, and action science as qualitative data generating methods. It is also suggested that combination of more methods can be an effective way of data generation. Based on this, in this research, questionnaire survey and qualitative interviews have been conducted. At first, the data generation of the questionnaire survey, then of the qualitative interviews, then finally the data analysis are going to be revealed in the next sections of this chapter.

3.4.1. Questionnaire surveys

Questionnaire surveys are usually thought as tools used in quantitative methodology, however, they can really be supportive and useful in a qualitative research too. The undoubtable advantages of questionnaire surveys are that the how often, why type of. questions can be quantified (Gummesson 1993) Moreover, which is more significant for this study, open ended, more complex, although still comprehensible questions can be implemented even in frustrating subjects because the respondents can keep their anonymity.

Tremendous literature are available about how questionnaire surveys should be created. The creation process of the survey followed the guidelines of Gummesson (1993). The first step was identifying the problem and the purpose of the survey which was to get sight of the operation, the positive and negative sides, and the project management of real life virtual teams at a higher perspective. The second step suggested to identify the population to be interviewed which was the easiest step since here the targeted audience was limited to project managers and members of virtual teams. Then following the suggestions of Gummesson (1993) and Harrison (2007), the survey was designed. Testing of the survey was limited, because only one of the virtual project managers could help in the testing. So he filled out the survey once as a test, then it was corrected according to his opinion, and later on he filled out the then open survey again. Thus, it might have resulted unfortunately in biasing that specific project manager. The next step was to select the sample which happened based on a public notice via social media, as already described in chapter 3.3. (Ethical considerations). From the reachable social networks, the finally contacted project managers notified me that they worked in virtual teams and were willing to cooperate for this research. This part was followed by the distribution of the questionnaire which happened online by sending the link of the survey via email

to the project managers. Then the project managers shared the link with their virtual team, and asked them to fill it out before a given deadline. As suggested by Gummesson (1993), some reminders were sent out to all the project managers two weeks after sending out the link for the first time. The current step is the procession and interpretation of the results. Finally, the results are going to be presented to the academic community after the submission of the thesis (Gummesson 1993).

In general, at the design of the questionnaire, three goals of the ideal question were set as a rule of thumb. These goals are to measure the underlying concept the question aims to reveal, not to measure other concepts, and to mean the same for all respondents. Also, technical terms, and jargon tried to be avoided (Harrison 2007). When it was not possible, a definition was provided for the participants to help the understanding, for example about cloud computing: "A quick introduction of cloud computing if you are not familiar with the phrase. Cloud computing makes it possible to deliver IT services through the Internet. So the server infrastructure should not be locally, can be far away, and the used software should not be installed to your computer, you reach everything online. Also, the documents uploaded to the cloud can be reached from anywhere with Internet connection and it is possible for more people to edit the same document. Some well-known examples for cloud computing services are: Google Docs, Netflix, Dropbox, Sharepoint, etc."

Regarding the type of questions, Gummesson (1993) and Harrison (2007) both suggested to include open and closed questions as well. The open ended questions were optional to be filled out, while the closed ended were obligatory to be answered. Open ended questions generally encourage more speech, getting probably deeper understanding of a matter. An example for open ended question is "Is there any other advantages for companies deriving from the usage of virtual teams, according to you? If yes, please, describe it. " However, a questionnaire should not be too time consuming for the respondents (Harrison 2007), especially not in case of an anonym survey, because the responders might got bored, frustrated, or busy, and might stop the filling instead. Moreover, closed ended questions are less likely to result misunderstandings (Harrison 2007). Thus, closed ended questions were also implemented, for example, "The following list contains some of the most common advantages of working in a virtual team. Please, indicate that how much you feel it is an important positive characteristic of working in a virtual team for you? ". In addition, the researcher attempted to put the questions without biasing the readers (Gummesson 1993). Furthermore, neutral options (Gummesson 1993) were included. For example, "What is you gender? Option1: female, Option 2: male, Option 3: prefer not to say". So the participants could avoid a sensitive subject even next to their anonymity if they felt so. When in a subject a more complete understanding was accounted, then the technique of primary and secondary questions (Gummesson 1993) was used. According to

Harrison (2007), providing middle categories result better data, thus some questions have that option as well, for example with options “Very important, Important, Neutral, Not important, Not true for my work”. Also, both the negative and positive sides of an item were presented in the survey as suggested by Harrison (2007), for example with the options “Very effective, Suitable, but not the best, Not effective, I don't know because I've never used it”.

Going further to the content of the questionnaire, it started with a brief introduction (Harrison 2007) of the researcher and of the research subject. Sharing as few information as possible about the aim of the research was on purpose. The bias of the respondents wanted to be avoided (Harrison 2007) as much as possible. The first five questions were more general as suggested by Harrison (2007). First of all, the gender dispersion was definitely uneven regarding the proportions of 14.3 % female and 85.7 % of male, which means the participation of 4 women and 17 men. The age dispersion however was quite even, as seen on Figure 3. below.

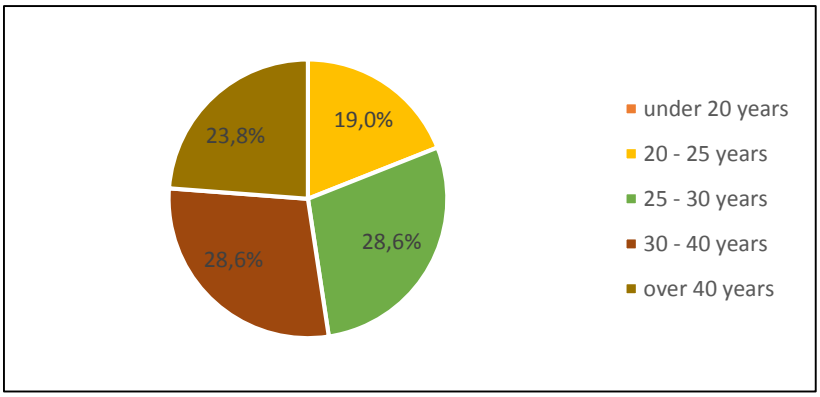

Figure 3.: Age dispersion among questionnaire respondents

Furthermore, regarding nationality, out of the 21 respondents 7 respondents were from Hungary, 1 from Australia, 1 from South Africa, 2 from China, 7 from India, 1 from Slovakia, 1 from England, and 1 from Italy. About the proportion of team members and leaders, 28.6 %, thus 6 people are project managers and 71.4 %, thus 15 people are team members. It suggests that there is one more virtual project manager among the respondents who is not among the 5 project managers contacted directly by the researcher. A possible reason for this is that virtual teams are usually operate in a matrix organisation, so someone might be a team member at one project, and a project manager in another. Participants were asked about their experience in virtual teams which is visible on Figure 4.

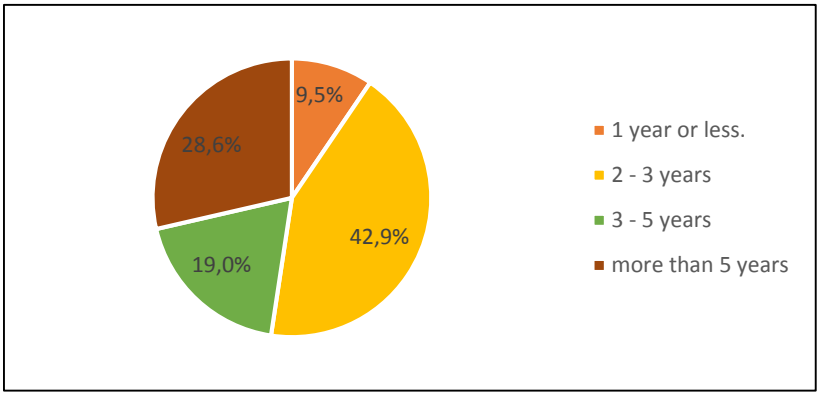

Figure 4.: Dispersion of virtual team experience among questionnaire respondents

Additionally, in order to get a general overview about the suitability of the surveyed, their IT background. The IT background of the respondents was relevant for the comparison of the further gained empirical data with the findings of previous research (Xin 2015). Based on their answers, almost half of the participants in the survey have an IT degree. On the other hand, 38 % of the respondents has not attended any special IT courses, and only 14 % attended special trainings in the field of IT, but not being an IT professional. The detailed results are visible on Figure 5. below.

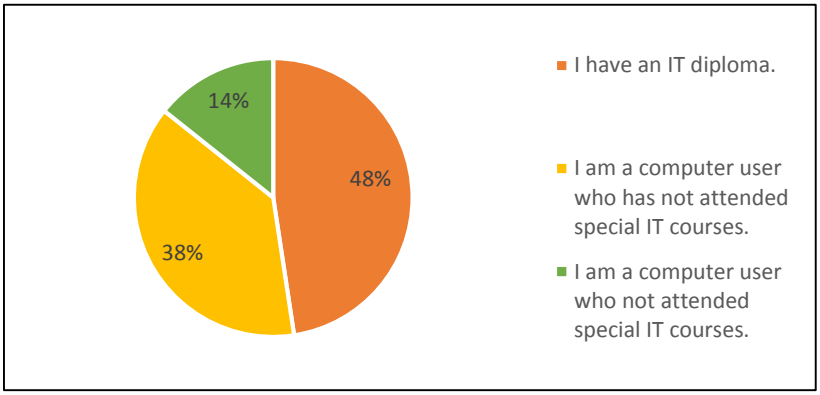

Figure 5.: Dispersion of IT education among questionnaire respondents

According to Eriksson et al. (2008), one out of the two essential qualifications of participant selection is suitability. Therefore, a question aimed to figure out how much time a virtual team participant whether team member or project manager spends in front of a computer a day. Since virtual teams communicate and collaborate constantly online, the time spent working with computer should be presumably high. In relevance to the research purpose, identifying this information about the surveyed is helpful in deciding about whether they even have the chance to use cloud computing tools or not. If they do not spend relevant amount of time operating via a computer, their responds to the questionnaire would not even be substantial. Fortunately, data says that all participants spend at least 5 hours a day with working on computer. Almost 20% spend 5-6 hours a day, while more than 80%

spend 7 hours or more working with computers daily. This data makes the target group reliable for the research purpose. See details below on Figure 6.

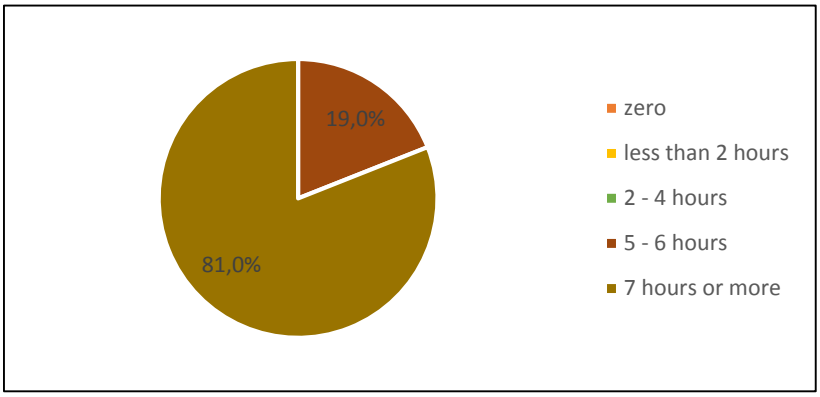

Figure 6.: Daily amount of computer usage of questionnaire respondents

According to Eriksson et al. (2008), the other essential qualification of participation selection is accessibility of the participants. These qualifications, indeed, turned out to be difficult to fulfil. Especially regarding the fact that for a better a sampling of virtual teams, the more international the respondents, the better diversity can be achieved. In this case, the researcher could only use her direct and indirect networks to reach people working in virtual teams. As a result, five virtual project managers (for contact summary form see Table 6.) agreed to participate and send out the survey to their teams. Two out of the five leaders are from the same company, so the respondents come from four different companies. The profile and locations of the companies are completely different and fortunately, they cover several countries. More information about the participating companies are visible in Table 5.

Industry	**Company description**
Automotive manufacturing	An Italian company that develops and manufactures modules, systems, and components. The company has 38000 employees and is present in 19 countries. The contacted project manager is a Hungarian citizen but his working location is in Germany. His team members are from three locations from Italy, two facilities from Germany, and one from India.
International translation	A translation company with two locations in Hungary and one in Slovakia. Their main profile is mechanical and medical translations. The contacted project manager is a Hungarian citizen and she works from the Budapest (Hungary) office. Apart from at about 25 employees at the Hungarian and Slovakian locations, the company has dozens of professional translators across the world from Asia to the US.
IT services	And IT services company that offers software development, IT security consulting, security consulting, ICT network services, and financial consulting with two headquarters, one in Budapest, Hungary and one in London, UK. The number of employees is more than 65. The contacted project manager is a Hungarian citizen who currently lives and works from Mexico. While currently his team is solely in Hungary, he used to have team members from Norway, Finland, UK, Portugal, Germany, Denmark, Italy, and French.

Minerals and cement	A multinational company from the cement industry profiling from engineering of machines to complete processing plants, including the maintenance, operation and support services of their products. This company employs around 13000 people in more than 50 countries. One of the contacted project manager is a Hungarian citizen, while the other is Slovakian, but both of them work from Denmark. Both of them have team members from more continents.

Table 5.: Description of the participating companies

All in all, the structure, the content, and the target group of the questionnaire survey is considered suitable for exploring general data regarding the subjects, while the interviews will approach more fine details. The complete questionnaire survey is available to see in Appendix 1.

Clearly, questionnaire surveys have their limitations, and it was not different in case of this study either. The achieved number of respondents was below the expected which was around 30. However, no more virtual teams were in the possible reach of the researcher. Unfortunately, only at the very end of the open responding period the researcher was notified that the server of one of the companies, which two project teams were from, blocked the survey for some participants, but not for all. Thus, it could have been a problem and might have resulted some team members who decided not to fill out the survey, but the researcher could not solve this problem by the time she got notified. Another minor accessibility problem appeared because the survey was blocked for members located in China, but the researcher got the information in time, and the answers got collected via email in MS Word format. Also, the validity of the gained data never can be thought as perfect and complete truth, since people tend to skew reality toward one or another side. Nevertheless, anonymity is believed to help being honest in questionnaires since the responders have nothing to lose, or to be ashamed of. Also, the subject of this thesis is not as perplexing as some other possible matters, for example a study of social relationships between supervisors and subordinates.

Overall, data generated by the questionnaire survey was sufficient and diverse, and it included answers and helpful contributions to the findings. Regarding the collected data and that the participants were located in three different continents and in several time zones, online questionnaire survey is justified as a valid form of data generation for this research.

3.4.2. Interviews

Personal interviews are one of the most common means of generating qualitative, empirical data (Gummesson 1993). This would already be a valid point for choosing this method, however, the main reason behind this choice is that interviews give opportunity to dig deeper into a subject. Interviews can reveal more fine data by finding the unspoken, but noticed connections, or emotions. Also an

interview is more personal and quicker for the participant than a survey, so they can share great amount of useful and rich, detailed information in a short time.

In general, interviews are made of questions and answers where usually the interviewer asks at first, then the interviewees talk and reply (Eriksson et al. 2008). However, they are not simply structured reports. They are informal and more similar to conversations (Gummesson 1993). In the case of this qualitative interview, the researcher prepared the questions, thus semi-structured interviews were held. Nevertheless, the interviewees were asked to tell, or ask about whatever comes to their mind, so to keep the conversation as informal as possible, but in the frame of the subject. Next to the exact content and context of the answers, the interviewer needs to listen carefully to take notice of reactions of the asked person. Body language, intonation, the used words and expressions, facial expressions and gestures all need to be regarded and noted by the interviewer (Gummesson 1993). In this study, the researcher made notes about the noticed non-verbal clues. Most of the times, interviews take place in person, face-to-face, but as Eriksson et al. (2008) mention as well, they can happen via telephone, or via other online communication tools. In this study, five interviews took place altogether, out of which three were online via audio-video collaboration tool, and two were held face-to-face in a café.

According to Eriksson et al. (2008), there are two interview research approaches. The emotionalists, or subjectivists focus on the how question. This approach looks into people's understanding, viewpoints, or their emotions. While positivists, or otherwise called naturalists, or realists want to know facts. They want to get information by the 'what' question. Usually, they ask the same questions to all the participants and they try to compare the answers, get conclusions from those, they add together the complete picture from point to point by getting different pieces from different interviewees (Eriksson et al. 2008). In addition, Eriksson et al. (2008) introduce three types of interview. In the first one, structured and standardized questions are asked and these are mostly 'what' questions. The second type is a partly structured, guided interview where the questions set a frame for the theme of the interview, but there is a variations in wording with both 'how' and 'what' type of questions. The last type is a totally informal, unstructured interview where there is huge freedom to move in the conversation (Eriksson et al. 2008). The interviews conducted for this thesis followed the positivist research paradigm and the non-verbal information of the respondents were also regarded during data generation. Furthermore, the questions were created according to the second type of interview questions introduced by Eriksson et al. (2008).

Regarding the documentation of interviews, Gummesson (1993) says that there are two possible strategies. In the first strategy, the interviewer makes notes, or record the conversations. On the one hand, it makes easier to return to the interview during data analysis. On the other hand, it takes much

time. In the second strategy, the interviewer only writes down the facts, the hard data, or some opinions, impressions, but does not record the entire interview. This way is less time consuming, but there is no chance for re-examination of the data, for that, a new interview has to be arranged (Gummesson 1993). At this research, the first strategy was implemented. The researcher, after she asked the permission of the interviewees, recorded the conversations with a smartphone. As the second step, she wrote everything down, so she can read the materials carefully, she can highlight the similarities, the differences, so she can study the gained data after the interview. Also, it is possible to listen to the interviews again for the intonation, or pauses for better understanding.

The structure of the interview was similarly built as the structure of the survey. In the first question the interviewees were asked to introduce themselves, then the second question asked about that how long they have been working in a virtual team. With the next two questions, the interviewees were getting closer to the research purpose by asking if they have any preference between working in a conventional and in a virtual team. In the next questions, the respondents were asked directly about the up and down sides of virtual project management, and of virtual teams in general. From that point on, the questions targeted virtual collaboration and the collaboration tools for that. The complete list of the interview questions are available to view in Appendix 2.

Even though three out of five interviews were online, the researcher tried to keep the suggestions of Eriksson et al. (2008) regarding interviews with business people. According to that, the scheduling of the interviews were set at least 2 weeks before the meeting. Also, the agreed time was adjusted to the timetable of the interviewees. The researcher showed up online, and personally as well a bit in advance to the interview. Appropriate appearance was kept in mind too. In addition, at the beginning of the interview, the researcher introduced herself and the topic, then asked permission to record the conversation. The interview was finished according to the previously agreed time period. After the interview, the researcher sent the typed version to the interviewee for review. The process of the interviews closed with a thank you e-mail to each participant.

Participant	Age	Nationality	Residence	Position	Experience in virtual teams	Type of interview	Duration
A	25	Hungarian	Mexico	Project Manager	3 years	Online	49 min
B	32	Hungarian	Germany	Project Responsible	8 years	Online	71 min

C	27	Slovakian	Denmark	Project Manager	3 years	Online	25 min
D	25	Hungarian	Hungary	Project Manager	1.5 years	Face-to-face	18 min
E	31	Hungarian	Denmark	Global Category Manager	10 years	Face-to-face	32 min

Table 6.: Contact summary form of the interviews

Qualitative interviews have their limitations as well. In this research, reaching virtual project managers was essential not only for the interviews themselves, but for the questionnaire surveys too because project managers were the ones sharing the survey with their team members. Thus, the most obvious limitation was the number of virtual project managers who were willing to participate in this research. In the end, all the participating project managers got out from the social network of the researcher which is a limitation regarding the demographical dispersion, however, the author believes it might have resulted more honest opinions, thus more valid data. Detailed information about the interviewed project managers are available in Table 6.

Altogether, the qualitative interviews generated much more useful, new, and sometimes surprising information than expected at the beginning. Most of the interviewees were really helpful, talkative, and had great experience in the research area. Thus, the semi-structured interviews turned out to be adequate choice for data generation in this master's thesis.

3.5. Data analysis and interpretation

Gummesson (2005) says that analysis and interpretation cannot be separated clearly. That is why data analysis and interpretation are included in one chapter. In the next chapters, similarly as before, the data analysis of questionnaire surveys and then the interviews are going to be discussed.

3.5.1. Questionnaire surveys

Although, in this research, questionnaire surveys serve as the tools of qualitative methodology, for their analysis descriptive statistics were used for informative purposes and in order to provide more transparency to the data. Thus, the data was analysed statistically and was displayed via diagrams and tables. Approaching both research questions in the survey, open and closed ending questions were used as well. Questions with option buttons, or check boxes were analysed by counting the proportion of one option to all the answers. Four examples for this are Figure 3., Figure 4., Figure 5., and Figure

6. in chapter 3.4.1. (Questionnaire surveys). By this type of displaying, the analysis of the results was problem free due to the high transparency of the data.

At open ended questions, the answers were analysed by simply sorting the given information into different subject groups. Other information were mapped into tables showing the ideas and opinions of the respondents. Tables are great displaying formats to highlight the similarities and differences between the findings of previous research studies and of this thesis. The last step in the analysis of questionnaires was writing down the results based on the created diagrams and tables. After the analysis of the interviews, the two analysed data set were combined which resulted the findings and conclusions.

3.5.2. Interviews

In qualitative research, data generation, analysis and interpretation often happen at the same time (Gummesson 1993). In this research, during the conduction of the interviews, analysis and interpretation have also been started. The field notes and impressions from the interviewees were inevitably forming some of the final conclusions already during the data generation phase. After the end of the interviewing period, a more formal analysis started based on qualitative data analysis of Miles et al. (1994). The chosen technique for analysing the interviews was coding. In coding, dissection of field notes and transcriptions have to be done while the connections need to be preserved. For that, differentiation and combination of data are keys to succeed. The codes are tags or labels connecting piles of information carrying same or similar meanings, or characteristics in the examined field (Miles et al. 1994).

Data analysis of the interviews began with coding of transcriptions. For this analysis, colours were pairing with different meanings as codes. The different colour codes and the connected meanings are visible in Table 7. below.

Colour	**Meaning**
Brown	Definition of virtual teams
Pink	Advantages of virtual project management
Purple	Disadvantages of virtual project management
Dark green	Characteristics of virtual project management
Dark blue	Project management actions to aim virtual challenges

Yellow	Characteristics of traditional project management
Pale blue	IT literacy
Pale green	Cloud computing and other collaboration tools
Red	Satisfaction with available collaboration tools

Table 7.: Colour coding for the analysis of the interviews

The transcripts of the interviews consisted altogether 28 pages which were coding after all the interviews had been conducted. The reason behind it was the time schedules of the interviewees were very strict, so the interviews were conducted almost after each other in time. Transcripts were read twice, so that no relations, or correlations could have been missed. Then the coded parts were collected together by colours, after that the relationships between the coloured piled of information were identified. After that, the analysed results of the questionnaire survey and of the interviews were compounded which together gave the material for the findings and conclusions.

3.6. Summary of the research process

Summing up, this research was based on the hermeneutic paradigm of qualitative methodology. For data generation, online questionnaire surveys and semi-structured qualitative interviews were used. The target audience was consisting of virtual team members and virtual project managers. For data analysis descriptive statistics and data coding were implemented.

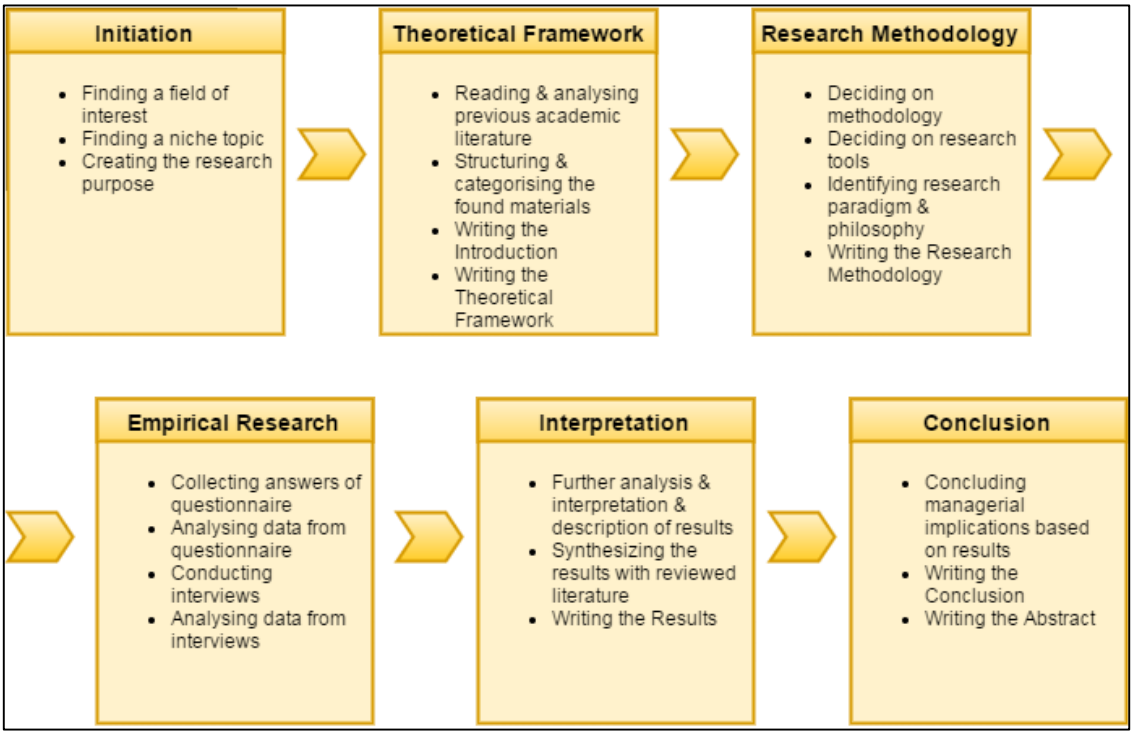

Figure 7.: Illustration of the research process

As illustrated on Figure 7., the research process started with an initiative phase where finding the research interest and a niche research topic were in the focus. The next step was reviewing the previous academic works published in the research field, then writing the theoretical framework based on those. During the next step, choosing the research methodology and the research tools, as well as deciding next to the followed strategic approach and philosophy prevented the actual writing of the research methodology chapter. Then the data generation phase has started with conducting the questionnaire survey and the semi-structured interviews, as well as analysing those. The analysed data then become interpreted. Finally, the conclusions and managerial implications have been gained and described.

4. RESULTS

The overall aim of this thesis is to fulfil the research purposes, thus to add relevant findings to the field of virtual project management, as well as to the intersection of virtual project management and cloud computing. Furthermore, this thesis aims as well to answer the research questions: 'What are the perceived advantages and challenges in the project management of virtual teams?'; 'How can cloud computing tools support the project management of virtual teams?'. In this chapter, the results and interpretations of the questionnaire survey (chapter 4.1.) and of the qualitative interviews (chapter 4.2.) are going to be included in order to address the research questions. It is followed by a short summary of the results (chapter 4.3.) based on both sources. Lastly, the found empirical information and interpretations are going to be put to the synthesis of previous academic studies introduced in the theoretical framework (chapter 4.4.).

4.1. Results and interpretation of questionnaire survey

4.1.1. Identified advantages and challenges of virtual project management

Gaining empirical data about what virtual managers and virtual team members identify as advantages in the project management of virtual teams is part of the first research question. For this purpose, at first, respondents were showed a set of the most common advantages of working at a virtual project according to the introduced academic literature. Their task was to indicate how important they considered the given advantages. Results indicate that the fact that the surveyed can be involved in international, or global projects is very important for many. Working with foreign people is also considered very important by relevant amount of participants. Gaining higher IT knowledge due to working in virtual teams is all in all neutral feeling for the participants. The same is true for the possibility of home office, because it is really, or somewhat important for more, but for at least the same amount of people it is neutral or not important. Surprisingly the possibility to practice a foreign language was mainly neutral. The detailed results are visible on Figure 8. on the next page.

Furthermore, in order to widen the perspective about what actual participants of virtual teams believe as advantages, if they have something different in mind than the previously given options, an open ended, and not obligatory question was included. 6 participants replied to that. They mention increased global knowledge, getting to know more about different cultures, also that the gained global knowledge can be shared with others working in traditional teams. In addition, they say virtual projects trigger higher efficiency, and that getting foreigner friends is an advantage. The thoughts of the respondents are visible in Table 8. on the next page.

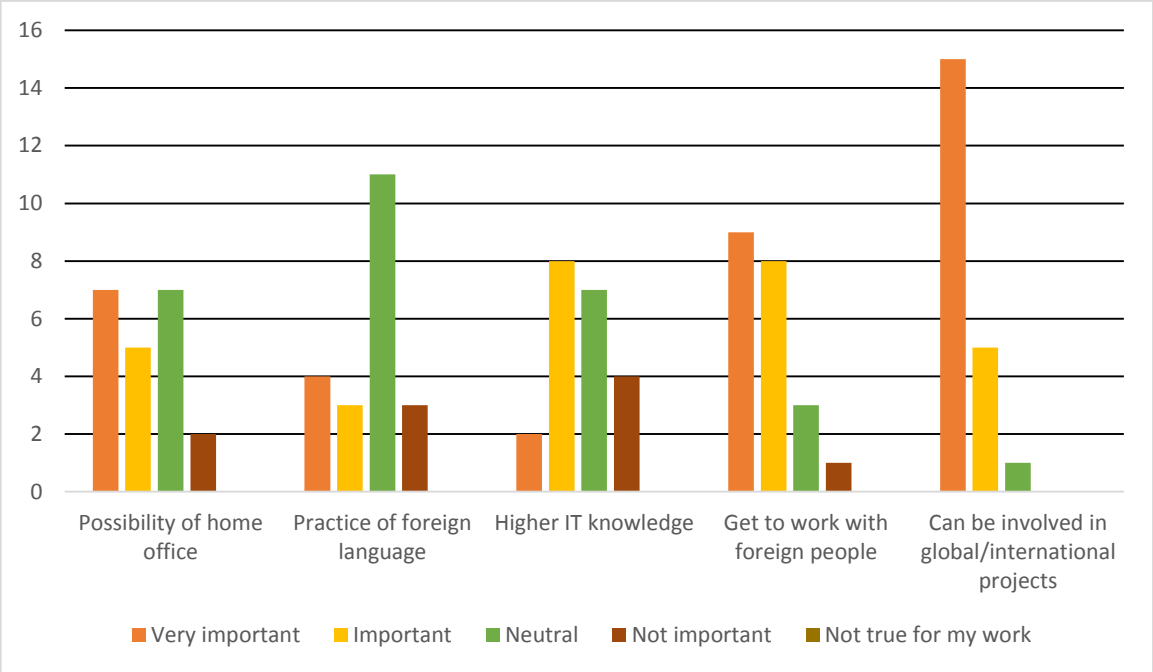

Figure 8.: Advantages of virtual project work according to questionnaire respondents

"Increased knowledge of global market and supply."
"We get to witness and learn about different cultures, religions, and pass on the knowledge."
"Sharing of skills"
"Exposure to different cultures and values. Helpful in career development."
"Flexible working hours are leading to higher efficiency."
"When working in a multi-country team from time to time you happen to make more friendship than with your fellow citizens."

Table 8.: Advantages of virtual project work defined by participants

The following part started to focus on the perceived challenges in virtual project management. At first, participants were showed the most common virtual project management challenges according to the introduced academic literature. They needed to indicate how problematic they felt regarding the given difficulties. Two options were given to indicate something as problematic, serious problem and problem. Based on the summed of these two options, different time zones are identified as the most significant challenge. Lack of face to face contact is the second most relevant challenge, while the lack of trust is the third. Then three characteristics of virtual project management are got the same number of votes, these are confusion and distorted information flow, free riding, and cultural differences. The less relevant challenges according to the results are difficulty of performance, the

feeling of isolation, and the usage of a foreign language as a common language. Only 4 people consider isolation, and only 3 identified foreign language as a common language problematic, thus these cannot be accounted generally as challenges in the field of virtual project management. They must originate in personal preferences, or abilities. The results are displayed on Figure 9. for better understanding.

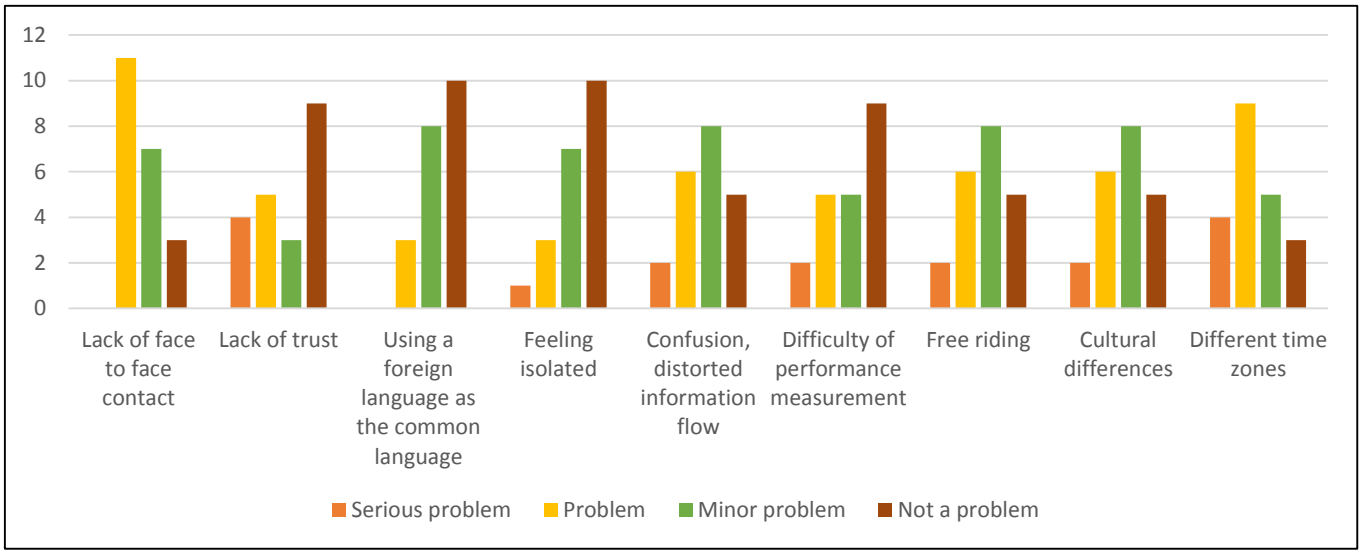

Figure 9.: Challenges of virtual project work according to questionnaire respondents

The next question was open ended, and again, just with the advantages, the respondents were given a chance to add their own identified challenges of virtual work if they have not found those listed in the previous question. It was not an obligatory question, and was answered by 9 people which of 7 was informative. One person mentions the dependence on IT infrastructure which is usually worse quality in lower wage countries. Another mentioned disadvantage is lack of seeing gestures of meeting participants. Someone else says that understanding the virtual team members' need is difficult. Also, it is added that the interest of virtual team members toward the project is different. Furthermore, not enough pressure can be put to virtual team members without at least one face-to-face meeting. Finally, a participant talked about the difficulty that in a virtual team anybody can decide to be 'not available', so they do not respond to calls, or emails. The proper answers are visible in Table 9.

"If IT system is down, then not possible to organize meetings. Also, in India or China the network broadband may be slow, therefore screen sharing or other methods may be limited."
"Most often you do not see the reaction to certain situation, the small gestures, movements with legs, etc. - the points that are not expressed on camera."
"Understanding / grasping their needs."

“The interest on the project is not same across virtual team members.”
“Less pressure can be placed on employees in new projects if the team members have not met yet personally.”
“In case of a problem, a person can choose to be 'not available' – e.g. not picking up the phone, not answering to e-mails, etc... This can cause serious issues.”

Table 9.: Challenges of virtual project work defined by respondents

4.1.2. Cloud computing supporting virtual project management

From this point, the questions aimed to reveal information relevant to the second research question. In an introductory question, the responders were asked if they have heard about cloud computing. The general awareness of cloud computing within the surveyed is promising, because two thirds of the participants, thus 76.2 % has already heard about cloud computing, while only 5 people, thus 23.8 % have not.

The next question focused on the frequency of online collaboration tool usage. The frequency of usage indicate that how much use virtual team participants attribute to a collaboration tool, since the choice of what they decide to use is theirs. The fact that not only cloud collaboration tools are listed is on purpose. In case of listing only cloud computing tools, the respondent might have been biased, since they do use other tools, for example the traditional telephone. Results indicate, that undoubtedly, the most relevant collaboration tool is email which is used by every day by all the surveyed. The second place is taken, surprisingly by the online messaging, alias internal chat, and the telephone and online shared calendars share the third place. Project management software in cloud, and document management in cloud are frequently used collaboration tools as well. Audio-video calls, and cloud applications on smartphones, however, are not often used by virtual team members and leaders. The least popular collaboration tool is the CRM database stored in cloud. The detailed results are available on Figure 10.

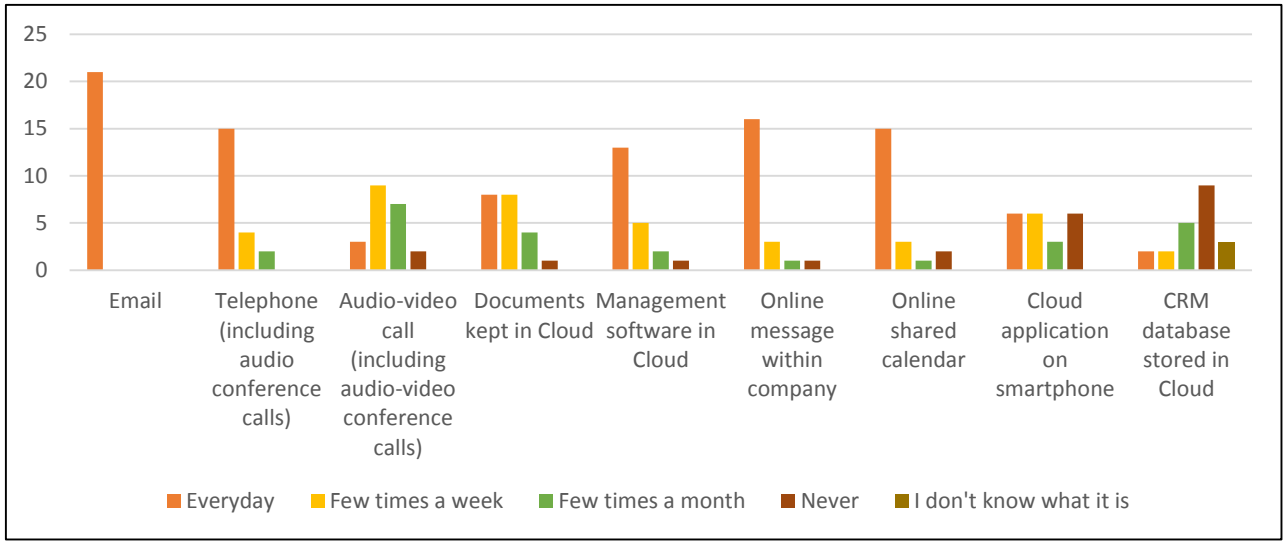

Figure 10.: Frequency of online collaboration tool usage according to questionnaire respondents

In an open ended, not obligatory question, the respondents had the chance to share if they use any other collaboration tools. 4 participants gave answers which are very straightforward, thus they are visible in Table 10.

"supplier agreement database"
"box, Dropbox, Doodle, Skype, conference call centers, Webex, Jabber"
"Atlassian"
"FTP"

Table 10.: Other collaboration tools used by respondents

In addition, participants were asked to indicate how effective, or useful they consider the already mentioned collaboration tools. All in all, not many negative opinions regarding the effectiveness of the listed collaboration tools were given. The first place regarding effectiveness is taken by online messaging, but email, telephone, and audio-video calls are considered as very effective or suitable by all the surveyed as well. Also, shared calendars are said to be very effective of suitable by all participants, but one who has never used it. Documents kept in cloud and project management software in cloud are also considered as effective collaboration tools since relevant amount of participant described them as very effective or suitable for virtual collaboration. Even cloud applications on smartphone are regarded as effective collaboration tools because more than half of the respondents identify them as very effective or suitable. These results are visible in details on Figure 11.

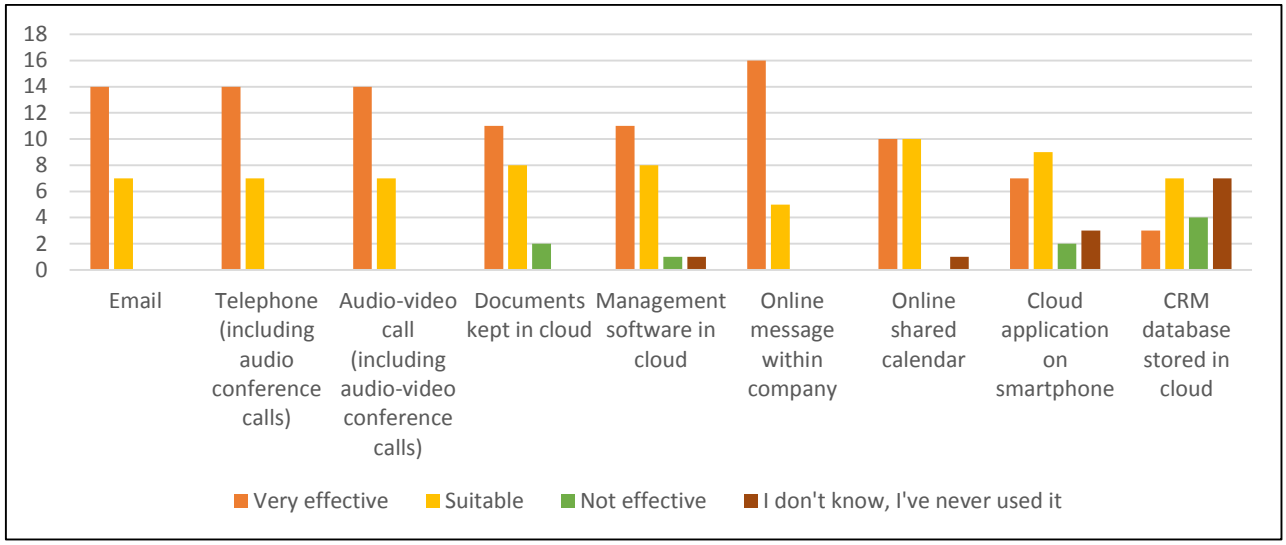

Figure 11.: Effectiveness of online collaboration tools according to questionnaire respondents

In order to synthesize the results relating to the second research purpose with the literature review, the next question aimed to get information about how comfortable the respondents found the usage of the mentioned collaboration tools. The results do not show significant differences. All surveyed think that the usage of email, audio-video calls, and internal online messaging is very comfortable or suitable. It is also true for online shared calendar, with the difference that there is again one person who is not familiar with that tool. While apart from one person all participants regard telephone, cloud kept documents, and project management software in cloud as comfortable or suitable. Cloud applications on smartphone and cloud kept CRM database show some, but yet not relevant discomfort. The data is available to view for better transparency on Figure 12.

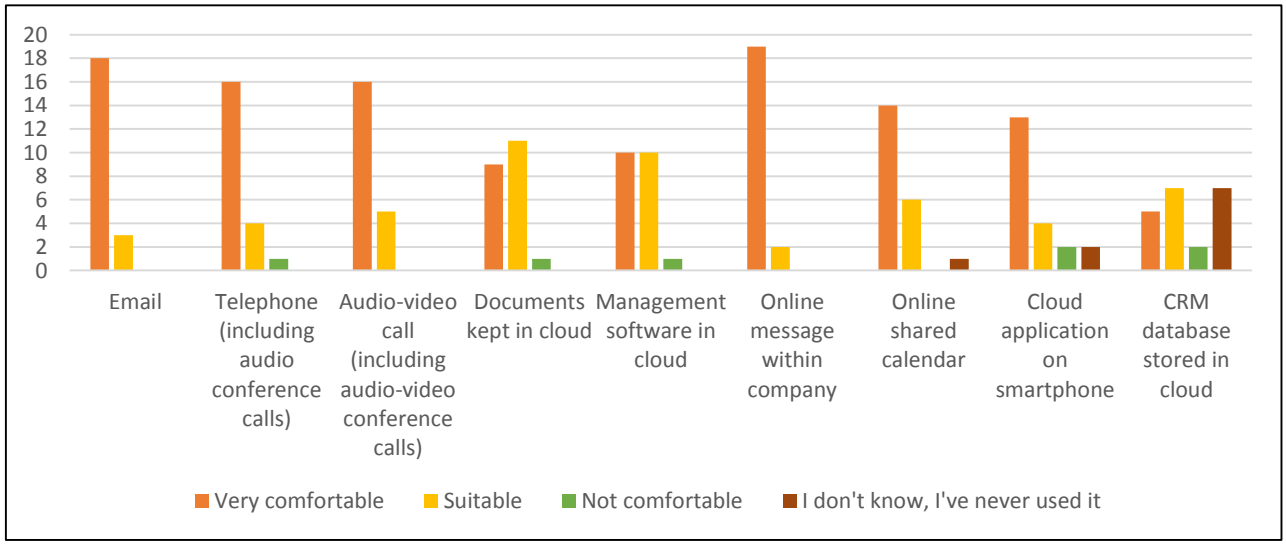

Figure 12.: Comfort of collaboration tool usage according to questionnaire respondents

The next question focused on the perceived advantages of cloud computer tools, how the actual users believe cloud computing affects their work, and the performance of the virtual team altogether. Thus, it aimed directly the research purpose. Again, not only cloud computing tools are listed in order to

avoid biasing the respondents. Virtual team members and virtual project managers were asked about whether and how much the mentioned collaboration tools enhance business processes, and/or better decision making in virtual project work. The findings indicate that apart from telephone, the majority of the responders believe that the listed collaboration tools enhance business processes and result in better decision making. Opinions about the effects of telephone are diverse. One third of the surveyed believes that telephone enhance business processes, another one third thinks that telephone help making better decisions, but almost one third considers telephone as effective in both fields. The findings in details are visible on Figure 13.

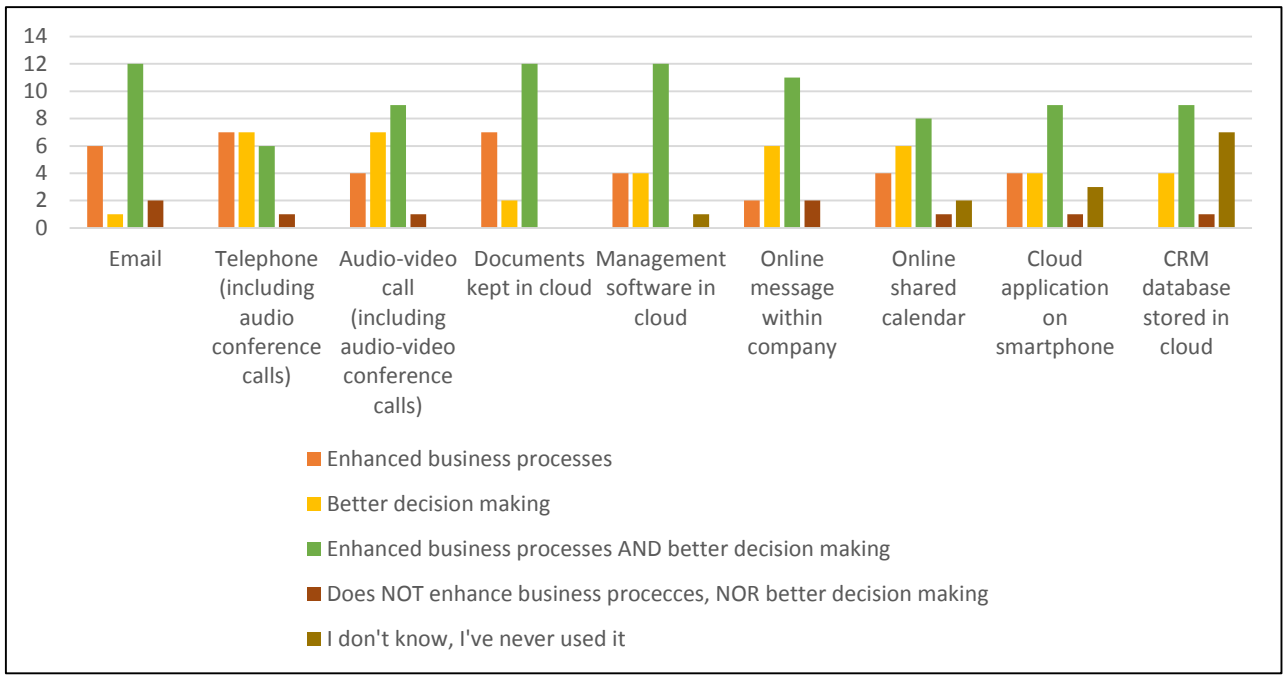

Figure 13.: Improvements by collaboration tools according to questionnaire respondents

4.1.3. Overall satisfaction with virtual project management and cloud computing

Finally, three questions were asked in order to gain general understanding of the satisfaction of the virtual team participants and leaders about the virtual work form. It is important to mention, that in avoidance of biasing the surveyed, the question about working preference was the first question of the survey. So, respondents were asked about their preference of working environment. For the majority which was 13 respondents, thus 61.9 % both virtual and traditional teams are equally suitable environment. While 5 people, thus 23.8 % prefer a virtual team, while 3 persons, 14.3 % prefer a traditional team. See below on Figure 14.

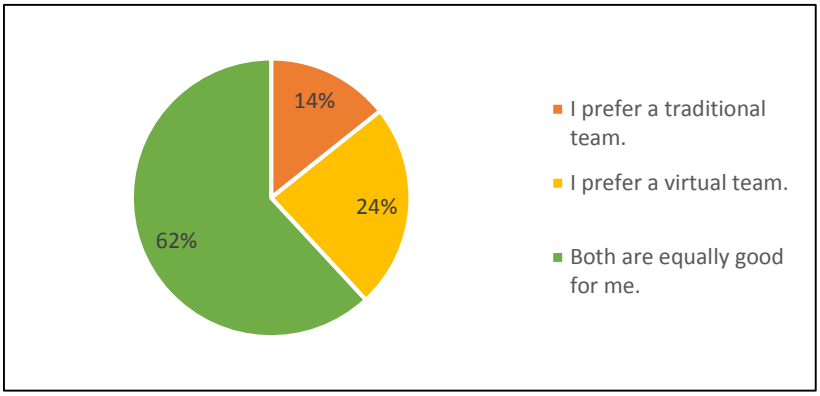

Figure 14: Preference of working environment by questionnaire respondents

In the closing part of the questionnaire, the surveyed evaluated their satisfaction with their virtual project environment after they had been lead through thinking about both the advantages, disadvantages, and about available cloud computing tools, and whether they are considered helpful for them or not. So, the last obligatory question's goal was to explore the general satisfaction of the surveyed virtual team members and managers with the available collaboration tools at their workplace. As a result, a slightly more than half of the respondents, 11 people claim to be satisfied, but they could appreciate some improvements. On the other hand, 10 people, are very satisfied with the available tools for daily use in virtual work. Thus, nobody incline being dissatisfied at all. Then participants had the option to share their thoughts about possible improvements of virtual cooperation in an open ended, not obligatory question. 8 out of 21 surveyed gave response which include the followings: globally available information repository, better standardisation with used collaboration within the virtual team, better structured collaboration tool such as Sharepoint, more available collaboration tools, more automatized information flow, integration of systems, online chat group for the virtual team. The proper answers are visible in Table 11. below.

"Stability, flexibility."
"One repository where all information within the company can be stored."
"Maybe start being more aligned within the team on using the tools."
"Tools like Sharepoint are good in the beginning, but get cumbersome over time. Therefore, a tool that allows more structured collaboration within the team will be helpful."
"I would suggest to have more collaboration tools under our company. In many cases, the tools of collaboration depend on the partner companies."
"Automatic signalling via email of new contents."
"The integration of different systems."

"Online message / chat group for the whole team."

Table 11.: Improvements for more successful virtual collaboration suggested by questionnaire respondents

4.2. Results and interpretation of qualitative interviews

The interviews have been conducted in a semi-structured, but still informal way. The gained information considered relevant to the research questions are described in this chapter, while all the questions of the interviews are available as Appendix 2.

4.2.1. Identified advantages and challenges of virtual project management

In order to purpose the first research question, the first part of the interview questions were concentrated around the characteristics of virtual project management. As a result, several advantages and challenges of virtual project management have been identified by the interviewees.

Table 12. shows which positive characteristics were mentioned by which virtual managers.

Participants **Advantages**	**A**	**B**	**C**	**D**	**E**
Cost reduction	X	X			
Better effectiveness	X	X		X	
Flexibility	X				X
Faster information flow / communication		X	X	X	
Better visualisation			X		
Global operation			X	X	
Better monitoring				X	
Comfortable working environment (home office)					X
Better recruitment options					X
Up-to-date documentation					X
Diversity in team					X
Different time zones					X

Table 12.: Advantages of virtual project management identified by the interviewees

Cost reduction as an advantage of virtual project management was mentioned by 2 interviewed. Participant A described the reason for it as *"Because at given areas like Eastern-Europe or India you*

can find the proper IT skilled technicians and their salaries are lower than the average in Western-Europe or in America."

Better effectiveness was identified by 3 participants in different aspects. Participant A said *"You are just not sitting over your coffee, stirring it and having a chit chat about small things, you are really focused on your tasks and to have it done…"* Participant B mentioned briefly that *"If you have the focus from the colleagues, I think it's effective."* While Participant D thought that *"You can communicate with more people at one time, so you can be really efficient in virtual teams."*

Flexibility was highlighted by 2 managers. Participant A reasoned it as *"With all the tools, I can just add new tasks, I can just overview what's left, what's next and simply it gives you freedom in time."* While Participant E explained that *"I have an Indian gentleman working for me who is my data analyst. So he is doing a great deal of the job that we are doing with the team globally in the US or in South Africa or in South America or Australia or wherever. This makes it very flexible. He doesn't need to be with us physically in the same office and still he can contribute."* He also added later on that *"It doesn't matter which country a team member sits in. If you find the right team member, you just attach him/her to the organisation."*

Faster information flow and faster communication was mentioned by 3 participants. Participant B explained that *"It's faster than to catch the guys from example in Italy, or in France, or just to travel to my land just to have a meeting."* Participant C added that *"The time between switching meetings is one minute, other than travelling takes some time."* Participant D told that *"Communication via email or telephone is way quicker than you know, you work in person."*

Better visualisation of a problem was regarded as an advantage of virtual teams by 1 person. He expounded that *"In virtual project, maybe it's even better that it's possible to share screens and draw at the same time, combine screening."*

Global operation was regarded as a positive characteristic of virtual project management by 2 people. Participant C stated that *"You can jump between time zones and continents."* Participant D explained that *"You can cross the physical boundaries, you can work with people from around the world."*

Better monitoring was mentioned by 1 manager. Participant D told that *"Maybe because most of the communication of written, you can track everything down. You have everything documented, you have the confirmations, the questions. You can always have evidence of what you have done."*

The last five advantages of virtual project management were specified by 1 manager, Participant E. He said that working from home office might result a comfortable working environment: *"For the*

employees it (home office*) can be very desirable work form. They can save a lot of time on travelling and getting ready in the morning…"*

He also explained that virtual projects give possibility to better recruitment:

"If I want to recruit someone to the project team who is very specific with his knowledge. Let's say a category. If I want to recruit a compressor expert, probably here in Denmark we might find a compressor expert maybe, maybe not. Maybe we need to pay 10 times the salary that we would pay in India or somewhere else. It gives me a great flexibility to get those kind of people to the team who have very niche knowledge about certain products or certain processes."

Up-to-date documentation was also considered as a plus by him: *"The documentation what we have with the project is far more up-to-date because we never know who will check to documentation at what time of the day. That's the only good way that we can work together that we have up-to-date documentation."*

Additionally, diversity of the virtual team achieved by the different cultural backgrounds of the members was added by him as well. He said that *"You have more diverse team with more different thoughts, more different cultural background, so we have a far more holistic view what might be needed for the customer. Because everybody adds something different when we are trying to solve a question."*

Lastly, he showed positive side of different time zones: *"If we send something for him* (Indian colleague) *in the evening when it's daytime for us and asking for very quick analysis or something, the next day morning it can already be in my mailbox."*

In Table 13. the challenges of virtual project management identified by the interviewees are listed.

Participants **Challenges**	**A**	**B**	**C**	**D**	**E**
Less control over members	X	X			
Lack of personal relationships	X	X	X	X	X
Difficult to gain respect	X	X			
Technical issues	X	X		X	X
More difficult cooperation, reliability	X	X		X	
Different time zones	X			X	X

Different IT knowledge	X			X	X
Worse visualization		X			
Different English skills		X			
Multitasking at meetings		X	X		
Cultural differences		X			
Different benefits					X
Different holiday seasons					X
Different policies at sites					X

Table 13.: Challenges of virtual project management identified by interviewees

Regarding disadvantages of virtual project management, 2 virtual managers mentioned that it is more difficult to control their employees in a virtual team. Participant A explained that

"I feel in a traditional way, you control your team in a more strict way. You see each other daily, and the personal appearance is really important to put some pressure. When you just keep writing emails or communicating by phone, you can't really put the pressure on them."

Participant B said about this matter that

"If you do not have a team, you have no chance to reach the aim, the project targets. The way how you can reach these aims is to identify these colleagues whether you can trust what they say. (…) You have to identify the colleagues where you can have less trust. And you have to identify the colleagues who are able to understand that you need support and they are open to support you."

Lack of personal relationships and personal meetings, missing the informal knowledge about the further away colleagues were mentioned by all 5 project managers. Participant B highlighted this many times in his answers, for example: *"You have to chit-chat with them* (comment: Italian colleagues), *you have to go to the kitchen to take some coffees in order to discuss some points. I can confirm that some main topics have been discussed between two coffees."* While Participant E gave another detailed approach about it:

"On the non-virtual regular teams, of course that can be quite convenient when everyone is sitting on the same site and when you have a lunch you can have informal conversation or you spend more time with the people. That is helping you to get to know them more informally which might not happen in the virtual teams. For example, I don't know so much my team member in the US because he is a

bit far away, it's 1 or 2 hours overlapping with our time zones. (…) So it's quite difficult to get to know with the team member informally."

The fact that personal meetings are the most important in the initiation phase of a project was mentioned by more interviewees. After at least one personal kick-off meeting, the cooperation is said to be much more fluent and effective than without any personal contact.

Gaining respect as a leader was added as a difficult thing to do by 2 managers. Participant A described a situation in details that can show the reasons behind it:

"When you have an international project and you need to get involved with new people whom you have never met. Maybe they have 30-35 years of experience in their field. (…) You have only very simple information about them. You have a very busy schedule and just imagine that you have been working for the company for 35 years, and you are in a high position, and somebody finds you who is new on the project, and asks you to do some work for him. Theoretically, it would work like that, based on books that the people are getting to know each other, they start working together and everything is going to work out well. But in real work life, I would say, it's not working like that. At first, you need to get your respect. When you send the first email or do the first calls, basically, they ignore you, even if there is a deadline, a deadline on them as well. But because you are new in a team, they are not gonna deal with you in the beginning. And that's the really hard thing to give the proper presentation of yourself and the proper presence to make yourself accepted among the team and to get to that point that after that if you get in touch with them, they realize that they are really involved in that project, and they really have their part and it's not about that some new guy is bullying with them."

Technical issues like broken calls, background noise during an online conference, system breakdowns were added as disadvantages by 4 virtual leaders. Again, Participant A introduced possible situations:

"I'm facing many troubles with that when I'm having a call, I have different interruptions, I can have different issues with my service provider, sometimes the quality of the call is not the proper one and when you have a strict schedule, you just simply cannot allow to have that call 4 hours later or 2 days later because maybe you need to decide immediately about something."

While Participant E mentioned the followings: *"Technical issues, so it can happen very often that the Internet connection might not be as good in other countries and they are dropping off from telephone conferences. Or when we are sharing screens it's not coming through to the Indian people."*

Cooperation within the virtual team is problematic for 3 managers. Participant A has already mentioned an example for this in a previous quote. Participant B connected this issue with personal relationships as the followings: *"If you have a bad relationship with somebody, he will tell you okay, I don't give a ****. And after several escalation, you may get an answer which is half of the expectation."* Furthermore, Participant B added an informative description about why it is difficult to find reliability if someone is not presented in person: *"You have a really simply situation when somebody stated something and the other one just said the opposite. What can you do? Just drop a call to a third person* (comment: who is considered reliable) *and just tell him, I have this situation, can you please to clarify the situation?"*

Time zones as complicating factors in virtual cooperation were noted by 3 managers. Participant D expounded her reasons as *"When there's a problem and you have to communicate back and forth because a client or your employees have questions and maybe they're not in your time zone, it takes a day to get response from them. So sometimes it's time consuming."* Another aspect was added by Participant E: *"He* (Indian colleague) *is restricted with his Indian time zone, so when we have meetings with the US it tends to be quite late for him."*

Participant B and C described multitasking during virtual meetings as possible negative consequence of virtual cooperation. Participant B said that *"The other thing what can also happen that somebody just wants to try multitasking. You are in a call. You are just presenting something and you hear that somebody is typing some emails or some messages or via communicator, etc. And after one minute or two minutes, you receive a question that you have already answered."*

Cultural differences as a negative characteristic was mentioned only by Participant B, however, he emphasized that several times during the interview:

"I think the high level project management can be if you consider the working culture or attitude, approach of the company. The German company what I know is quite process oriented and the attitude of the colleagues is actually more or less the same. So, they know that they have processes, and this is a really big advantage of the company, and if you just follow the rules you will be able to reach the targets. If we consider another kind of working culture like Italian one, you will see that regular meetings are useless. You can try to set a regular meeting by weekly frequency, but after the second meeting, maybe 20 % of the needed colleagues will join it from Italy. (…) You will see that the colleagues from Italy prefer to have personnel contact."

Another informative situation description from him:

"For example at the German company, I experienced if somebody stated something, you can take it as a fact. In 5 %, maximum 10 % of the cases you have received an update. What is the situation at my current company? I go to Italy, we have a meeting, we agree on the steps what we need to do in order to reach a target. If you have a lucky situation, you receive an update within 2 days after the meeting that this is a mess what we have agreed and we have to use other steps, other schedules. If they do not really support, or follow the agreement, it can also happen that you just receive the same message after 2 weeks. Then you will have a situation where you have already communicated everything to the client, to the German customer which has the German expectations and you will have completely other situation, other schedules and you have to explain it to the client why you have this modification."

Finally, 3 new disadvantages were added by Participant E. He explained that the different office environments, and available equipment might result in some delays, or in worse performance.

"So it can happen that an Indian team member has far older IT equipment than what we might have in Europe or US. So their computers are slower or not as nice or they might not have as good headsets to attend a meeting, so there are differences in the team. I don't think it's causing any issue in between the team members, but for the performance. It is a bit more difficult for these team members to hear what we are talking. Very typical issue, in India we have a huge open office of few hundred people and everybody is working in virtual teams there. Everybody is talking at the same time, everybody is using a bit more inferior quality headphone. So, they very often need to ask twice or three times "What did you just say? What did you just mean?" Which is making a bit more difficult to work with them. It's difference between the geographical benefits."

Also, different holiday seasons might cause issues. He told the followings:

"The holiday seasons are again different in countries. While in Finland, Denmark would typically go in July on holiday, Indians would not go on holiday at all, or they are distributing it through the year, South Africans would go in January on holiday. Americans would go typically in August, or UK in August. So when we have the summer season, is different for everybody. We are not on holiday at the same period. In my projects it has not been a great issue but for some people who need to provide services, it might be an issue."

Lastly, there are different policies, formal processes in different locations of the same company. It can cause some friction, for example:

"The bureaucracy, yes. If they are not so used to work, particularly the HR, if they are not so much used for virtual teams. Say a country… if I want to recruit somebody in Peru where we have a smaller organisation, maybe 50 people. If they are not so much used to this that virtual team members might not need to even go to the office. They can work from home office. If they are not used to this way of working in Peru, then they might not understand what we are asking. They might say that why that person doesn't need to come to the office while the others need to come. Or getting approved the IT equipment that the person might need. Maybe the others have a PC, and this person would need to have a laptop. That might cause come friction. Why this person needs to have different equipment than the others? Even though I approve it because it's needed for the work, but that might cause some friction and maybe we need to explain why we need to do that."

4.2.2. Cloud computing supporting virtual project management

With regard to the second research question, the second half of the interviews were structured around the connection between cloud computing and virtual project management.

The interviewed managers mentioned the following collaboration tools used by them for managing a virtual team. All the collaboration tools listed below in Table 14., apart from the traditional telephone, can operate via cloud technology. Email, Sharepoint, MS Project, and MS Excel can work on desktop, or on cloud base as well, nevertheless, due to the research purpose, here they regarded as cloud computing tools.

Participants **Collaboration Tools**	**A**	**B**	**C**	**D**	**E**
Email	X	X	X	X	X
Telephone	X	X	X	X	X
Sharepoint			X		X
Cisco Jabber (Webex)	X			X	
Lync system	X				X
Conference calls		X			
Instant messenger	X				
File management in cloud	X	X	X	X	X
MS Excel		X	X		

MS PowerPoint		X			
MS Project		X	X		X
Data warehouse systems					X

Table 14.: Collaboration tools used by the interviewees

The description here is started with Sharepoint and Cisco Jabber, used to be called Webex. All the other tools of the list that come after these can be included as functions of these. Sharepoint and Cisco Jabber are online project management software with several functions helping project managers and virtual team members. Project planning, resource sharing, access right management, shared calendars, deadline and deliverable management, and many other functions are included. Participant A summed up Cisco Jabber as the following: *"You can involve many participants in that, actually, you can have your own presentation for tens or hundreds or people, they can follow you, they can see you, you can share your screen, and you have different voting functions."* Sharepoint and some other online project management tools, for example Project Place, mentioned by Participant E, are even more complex which is not always suitable, as expressed by Participant E:

"It was maybe a bit too advanced tool for the team we had. We could not even use so many functions, for me that's the same with Sharepoint anyways, but Project Place was a Swedish software if I am right and they have so many functions. You felt kinda lost when you were in the system. When you have too much, it's also not good. If you can't use it, it doesn't make sense to spend money on that, to purchase something that you can't use."

Lync system is a cloud based in-house communication tool. Participant E describes it as

"(…) have been revolutionary for me to use Lync systems far more than before. I would not consider Lync as a regular telephone anymore. You see the status of the person, if he is at a meeting, if he is available, if he is away from his computer. So you have more information than with telephone. When to call someone, you can set your status that I'm now busy, don't call me. It's interesting, it's a new way. Having now Lync, the chat is also far more used by me. When I have just a quick question, is it blue or is it the red what I should select? Then it is a very quick question sent to the person. While in old methods we would send a lengthier email more time spent. 3 times or 5 times that I spend with email for a very quick question, more formal."

Conference calls are online audio calls used by all virtual managers, however, here they are meant as separate software, not included in Sharepoint, Cisco Jabber, or in Lync. Separately, only Participant B uses them.

Instant messenger is an in-house chat, here it is meant as a separate software, not included in Sharepoint, Cisco Jabber, or in Lync. Although the chat function was mentioned by 3 managers, in this separate form, only Participant A uses it.

File management in the cloud is a collaboration tool used by all the interviewed project managers. The reader can think of Google Docs, or Dropbox which are the most popular similar software for a not business users. This tool allows to keep files available via the Internet from anywhere, also several people with the right authority access can edit them, so information is easy to access, edit, download, and share. Participant D, for example, use this function or tool for more purposes: *"We also use Google Docs within our own company, so that we can track each other's work. We also have some cloud platforms that we use with our client. So that they can upload there bigger files, so to move big files."*

MS Excel is probably the most well-known spreadsheet program of the world, while MS PowerPoint is one of the most used presentation tool. Probably all the asked project managers use these. However, here they only appear as tools used for online communication, or information sharing, and in that function, only Participant B and C mentioned to use them. Participant B added about PowerPoint that

"The colleagues, only at this company, they prefer to have everything via presentation. So, for that reason, what I normally do, it could be just a talk about software development activities, validation, series preparation with what the needed quality documentations, etc. I make slides for them about everything and send them."

MS Project is project planning, resource sharing, and project management software that is widely used by project managers in general. In this research, 3 virtual managers use it, however, they believe it has positive and negative sides too. Participant B says

"We use the MS project as a program to have a documentation on the different tasks or planning. But to tell you the truth, it can take six hours to make a perfect MS Project planning. But this is not checked by the others, not opened. If nobody tries taking the time to understand it, it's useless."

Online data warehouse systems were mentioned and described by Participant E as follows:

"Then we use data warehouse systems. At my previous work places, we had multiple ERP systems on different sites around the world, 20 plus, 30 plus different systems. For example, now we use a Finnish solution, Sievo solutions. Sievo is taking all the data from the different ERP systems and consolidating it and providing data warehouse solution if I want to retrieve data for whatever reason."

Email and telephone as collaboration tools are left to the end of this description, because they are the most frequently used, most well-known tools, however, recently they have started to fulfil different roles in virtual collaboration then they used to. The reason behind this is the appearance of all the above introduced newer generation tools. All interviewees were directly asked about their opinion of email and telephone which is visible in Table 15. All virtual project managers use both of them regularly.

Participant	Managerial views about email and telephone
A	*"I'm aware of the negative sides of these collaboration tools (…), I'm facing many troubles with that when I'm having a call, I have different interruptions, I can have different issues with my service provider, sometimes the quality of the call is not the proper one. (…) I think when you don't need a real-time answer, at that time the emails can be a perfect solution. But of course when you need to make real time decisions and you need to act quickly and needs to be really fast, at that time, yes, it can come up with many negative outcome."*
B	*"Phone, I think, is relatively good. Regarding the email, I have the experience that some colleagues are using the email (…) to have a real long conversation via email. (…)I think that still not clear for each team members how they should use the emails. Email, from my point of view, is there in order to document the decisions, in order to have a quick and short summary or description of a topic, in order to get the right support. If somebody drops me an email for example this kind of* (comment: showing like 15 cm long text by his hands) *text, I won't read it. If somebody is not able to summarize the topic in ten sentences, then we need a meeting, or a call conference."*
C	*"Well I kind of looking all mobile way and now using something like Skype or Lync. (…)You know emails cause these troubles because they are only one way. The more you write, the less understandable it becomes. So, you shouldn't write more than three lines, you pick up the phone."*
D	*"I think for virtual communication, both telephone and email are great. Sometimes the problem is that we have IT problems with the email server (…). And about telephone, again, you can't call someone if they're across the world. You can't just call someone in the middle of the night. They all have disadvantages and advantages, but I think they are basic and efficient tools to use for communication."*
E	*"The telephone, I think, is still part of the virtual team management because there are many time when I'm travelling and I don't have these tools* (comment: Lync) *in front of me (…).Or I send an email when I'm at an airport, or I'm on airplane and when I'm getting online again, they get all my thoughts in email. (…) When I compare now email to the Lync chat or something like that, so far in my life I have not considered email outdated, but in this respect I can say that's a newer generation way of communication, so maybe in a few years, we gonna say it's outdated. I don't think it's yet outdated. (…)I would not say telephone is outdated. There are so many times when you can't use Lync and you need to have the conventional telephone."*

Table 15.: Views of the interviewees about email and telephone

Furthermore, audio-video calls were asked directly about as well, in order to be able to compare the gained data with the theoretical framework. The opinions of the interviewed managers about audio-video calls are visible below in Table 16.

Participant	Managerial views about audio-video call
A	*"I have been participating at a few meetings which were so called tele presence meetings and at that time each member of the meeting had his own camera and your profile pictures and your live pictures could be seen on different flat screen TVs, but I'll be honest, I don't see the point of it. We were called by it to show our faces to our bosses."*
B	*"I can tell you that less than 30 times I used video conference. The reason is quite simply, I do not have the webcam in my computer. Because it's not allowed to have it if you go to the client. Especially if we are talking about the R&D, the development activities. But I have to say that if I have the possibility to have or use a webcam, I would use it. Because you can have a better understanding if you see the other one."*
C	*"I prefer this. Good thing is that you can record it then have somebody to cut important things out and they get short notes that you can send over. Rather than writing notes that you need to read for 3 pages, it's 3 minutes. (…) If you need to animate something and show the movement. You can see it* (comment: via audio-video call)*."*
D	*"I usually just call without video. (…) To tell you the truth, in our sector, people are introverts, so they are not really the type of people you would like to chat face-to-face. They are shy people. So it's sometimes even hard to call them, so I wouldn't risk calling them and seeing them at the same time."*
E	*"I was smiling because when it's 7:30 am, you wake up and then you go to a telephone conference with your coffee, you might not want others to see your face. We would not use it very often. Though we use it 1 out of 10 or 1 out of 20. That would be maybe the rate. I have a bit more formal conferences. We had video conference room in the previous company. Which is not Lync but something else. A video conference system was built there. We would have kick-off meetings of a brand new project and I want to have the stakeholders who I do not know. Maybe I have not met them or maybe once or twice but we are not well acquainted with each other. Then I would request to rather have a video conference meeting, bigger group maybe 10 people in China, 10 people in Europe and something like that. So we also see each other, so get a bit more connection with them. Or it might happen if 1 or 2 of my team members sometimes do video conference because we are a bit, to say, closer to each other. We have worked with each other for longer time, so it's not a problem when they see me on Monday morning that I have not combed my hair. I think video is a good tool, I would use it, but not as often as the simple telephone conference, but it's good, it's giving a bit closer reach to the person. A slightly bigger bond to the person."*

Table 16.: Views of the interviewees about video-audio call

Additionally, again in order to gain basis for comparison with the theoretical framework, participants were asked about the connection of IT literacy and membership in a virtual team. In Table 17., managerial approaches toward IT knowledge in a virtual team are listed.

Participant	Managerial views on IT literacy of virtual team members
A	*"IT competence matters, but an average, basic knowledge is enough. (…) You can learn it. But on the other hand, I would say no. If I'm just thinking about that we are parts of the Y generation, we have been raised among different types of technologies, we have the new waves of technology and actually if you find a young member, of course, he or she is going to be aware of the required technologies for sure. But I would mention that, not in a bad way, but older members of the team, sometimes can have troubles with the technical items and (…) it can be a real obstacle. That's why I was saying that you need a basic knowledge of IT and it's really mandatory."*
B	*"A minimum level of knowledge of the computer and some programs. Some programs like the Microsoft products and MS Office are those programs. (…) Generally speaking, if you have a really deep IT knowledge, it can speed up your activities. If you just have this kind of skills and*

	knowledge, but no motivation to be a part in a team, from my point of view, it's more or less useless."
C	*"Well IT knowledge is not that important, because most of the things you can Google. If you know how to use a browser and google what to do, you are sorted."*
D	*"I think it* (comment: IT knowledge) *makes things a lot easier. So I worked with people who had no idea what a computer was basically. They turned it on and sent an email, but it was really hard to explain something to them. They didn't know what a screenshot was and stuff like that. So yeah a little higher knowledge of IT is essential, I think. It's a must. (…) I have a lot of translators who use all the modern platforms of communication such as social media and cloud storage and stuff like that. And they are little bit advanced IT people. So I think it does matter."*
E	*"IT literacy is a demand in this field. I had team members at my previous work place who were elder generation. With all respect, they had great knowledge of the processes, or about the technical background, but when they needed to use certain software. Let's just talk about conferencing tools we use, they did not know how to make it full screen, how to zoom in, how to find things… Very typical thing, you join the online meeting and their microphone is muted, and they don't know how to unmute it, or very-very small things, they want to attach a headset, but they don't know how to set the computer to get the sound through the headset and not the laptop. Very small things which after a while take a lot of time. If each meeting we spend 5 minutes just to explain to people how to unmute themselves, or how to change the sound settings, if you multiply by that how many times you do this, it's a lot of time what we would use. So they have a disadvantage indeed. Though I met many elder persons who handled very well these and it was not an issue for them. It would be a selection criteria. A person needs to be IT literate on a regular 21st century level. (…)Thinking about the new generation, the newer the generation, the more likely they even want to do this* (comment: using virtual collaboration tools) *instead of the conventional methods."*

Table 17.: Views of the interviewees on IT literacy of virtual team members

4.2.3. Overall satisfaction with virtual project management and cloud computing

Finally, managers talked about their preferences and overall satisfaction regarding virtual project management and the available collaboration tools. Managers who do not have preference between virtual or traditional work (Participant C and D), and leaders who prefer virtual project management (Participant A and E) are, all in all, satisfied with the available collaboration tools given by their companies. As some possible further opportunity for develop virtual cooperation within a team, though not requirements, were mentioned. Participant A talked about a smart board:

"The desired tool would be a smart board where you have the chance to write on it and it's all digital, you have the chance to send out the information to other members, collaborators. You can have better drafts, better drawings, the quality of your presentation could be increased a lot by this tool. But basically I don't think that it's a huge must, because there are other alternative tools which work well. They can bring a certain quality, but in some ways, it would be helpful."

Participant E mentioned some other small rooms for improvement:

"I think I could take a bit more, like I could have slightly better headset from the company what I would use taking the hardware side. I think all the other hardware is fine. I could accept a bit more

developed Sharepoint. I think we are using the 2007 version of the Sharepoint. Because the IT department, they don't want to adapt the latest Sharepoint because of the bugs."

The general viewpoint of Participant C about the available collaboration tools is really outstanding and it gives an interesting and informative viewpoint toward the second research question. Some of his answers exemplify well his approach toward virtual work:

"Well IT knowledge is not that important, because most of the things you can Google. (…) Well, surprisingly for each project they never use the same (comment: same collaboration tools). *So I think that the first thing that I need like in Matrix* (comment: the movie called Matrix) *that's white area and you are allowed to do whatever you want. That's the point, you have unlimited possibilities because you can program whatever you want. That's all you need."*

Participant C represents the truly modern virtual project manager who feels really comfortable in virtual environment. Although, it is important to mention that he probably has higher IT knowledge than most of the solely business people since he seemed very convenient regarding programing an own software.

While Participant B, even though works as a virtual project manager, would prefer working in a traditional team, and he is not entirely satisfied with the available virtual communication options at his company, although, it is probably because of a special company culture, the heavy need for personal relationships in his projects based on his related statements were included earlier, or industrial characteristics according to him:

"If the team or the company itself is open to use this kind of tools, I would be really happy. (…) I think the possibility to use video conferences in a regular frequency would improve the communication and understanding."

For better understanding the situation of Participant B, a part of the conversation with the interviewer stands here:

"Interviewer: You believe that you could use better tools and you are aware of these existence, but the approach and mentality of your company and colleagues, they do not make it possible. Participant B: It depends on the company, but generally speaking yes."

He also expressed that even with audio-video calls, he does not feel the virtual communication real and he still waits for some better collaboration tool or solution to overcome of this obstacle. He said

"I'd say that if we talk about communication, we have the possibility to communicate on verbal way. For example via the phone, via emails or communicators. And I think we have a third possibility to have video conferences. I don't know if other companies have already developed other kind of possibilities, or communication ways just to have a feeling that the other team members are also connected. Just to have a higher level communication where you not only have to computer itself. I can see your face right now, but I still have the feeling that you're quite far away from Stuttgart. I do not have the feeling that you are in front of me (comment: interview was conducted via online audio-video tool)*."*

4.3. Summarizing the results

Based on the results of the questionnaire survey and of the qualitative interviews, regarding the research question 'What are the perceived advantages and challenges in the project management of virtual teams?', the advantages and challenges of virtual project management of the survey and of the interviews have been combined and divided into two categories each. Supported advantages and supported challenges are the ones that have been perceived by at least half of the participants of the survey, or by at least three of the interviewed virtual project managers. While emerged advantages and emerged challenges are the ones that have been perceived and mentioned in any form at least by one respondent of the questionnaire, or by at least one interviewee.

Supported advantages	**Emerged advantages**
Working globally	Cost reduction
Working with foreign people	Better visualisation
Better effectiveness	Global operation
Faster information flow	Better monitoring
Flexibility	Better recruitment options
	Up-to-date documentation
	Diversity in team
	Possibility of home office
	Practice of foreign language
	Gaining higher IT knowledge

	Increased global knowledge
	Getting to know different cultures

Table 18.: Summary of advantages perceived by participants of the research

As summarised in Table 18., according to the categorisation described, 5 supported, and 12 emerged advantages of virtual project management have been identified by the surveyed and interviewed virtual team members and virtual project managers.

Supported challenges	**Emerged challenges**
Different time zones	Confusion, distorted information flow
Lack of face-to-face contact	Free riding
Lack of personal relationships	Cultural differences
Technical issues	Difficulty of performance measurement
More difficult cooperation	Feeling of isolation
Different IT knowledge	Different language skills
	Less control over members
	Difficulty to gain respect
	Worse visualisation
	Multitasking at meetings
	Different benefits
	Different holiday seasons
	Lack of trust
	Different policies at sites

Table 19.: Summary of challenges perceived by participants of the research

Furthermore, as summarised in Table 19., 6 supported, and 14 emerged challenges of virtual project management have been identified by the surveyed and interviewed virtual team members and virtual project managers.

Answering the second research question, 'How can cloud computing tools support the project management of virtual teams?' requires more complex explanation. On the one hand, frequently used tools for virtual cooperation are email, online messaging, traditional telephone, and online shared calendars. It shows, that cloud computing products such as email, internal chat, or the shared calendars are necessary and supportive tools for the project management of virtual teams, but the telephone, which is also in the list, is not operating based on cloud technology and is still significant in virtual collaboration. Furthermore, cloud based project management software and document management in cloud are also considered as supportive and useful tools for virtual project management. On the other hand, regarding the effectiveness, the effective tools overlap almost completely with the frequently used tools, however, another tool, namely audio-video calls are listed as well. It shows that even though people consider it effective, they do not use it in their daily work. The results are summarised in Table 20.

Tools used frequently	**Tools considered effective**
1. Email	1. Online messaging
2. Online messaging	2. Email
3. Telephone	2. Telephone
4. Shared calendars	2. Audio-video calls
5. Project management software in cloud	3. Project management software in cloud
6. Document management in cloud	4. Document management in cloud
	5. Shared calendars

Table 20.: Summary of frequently used and effective collaboration tools according to the participants of the research

In addition, the fact that not only cloud based collaboration tools are used in virtual teams can be reasoned with the often mentioned technical issues, or inaccessibility of Internet. Thus, traditional telephone is still regarded as the most stable, most accountable collaboration tool. Even if telephone is more expensive for international calls, its infrastructure has the biggest network coverage globally.

Additionally, from the interviews it has been revealed that even though telephone and email are undoubtedly among the leaders of virtual collaboration tools, and the users are altogether satisfied with them, these tools are not considered as the best, but as the most available ones for virtual cooperation. Instant messaging integrated with supplementary functions would probably take the lead if the global Internet coverage would be as reliable as of the traditional telephone.

To sum up, 5 main advantages and 6 main challenges in project management of virtual teams have been identified. In addition, several other advantages and challenges have come to the surface based on this qualitative research. Furthermore, results show that cloud computing tools do not only support, but they are necessities for collaboration and cooperation in virtual project management. Besides, results indicate that the examined cloud computing tools enhance business processes and help in better decision making as well.

4.4. Synthesis of the results

First of all, about the perceived advantages and challenges of virtual project management, the reviewed academic works definitely analyse more challenges lying in virtual teams than advantages. Although this thesis was aimed to examine advantages and challenges of virtual project management at the same weight, in the end, the shift toward better analysed challenges has appeared in this research as well. The main reason behind it is that there are more challenges identified both by the respondents of the questionnaire, and by the interviewed managers than perceived advantages. In addition, comparing the emerged advantages by academic writers with the here found ones, from the category of supported advantages there is only one identical advantage, and that is flexibility. Regarding the emerged advantages category, the following advantages are overlapping with the ones identified in other reviewed academic research studies: better monitoring and up-to-date documentation, cost reduction, and better recruitment. Thus, the previous academic studies and this research have partially, but not entirely the same outcomes. Stepping toward to the challenges identified in this research and in others, there are more similarities. In the theoretical framework of this study, virtual project management challenges have been categories into 7 groups based on the overlaps in the read academic materials. Those are communication; isolation and confusion; developing trust; performance, diversity and virtual work-cycle management; free ride; cultural differences; and time zones. All, but the IT related challenges from the here found challenges can be put into one of those 7 categories, and in some form they have already been recognized as challenges. Surprisingly, among the reviewed previous academic studies, none has listed technical issues or different level of IT knowledge as difficulties in virtual work, while this study identifies them as 2 of the 5 supported

challenges of virtual cooperation. Apart from those, the here identified challenges are the same, or similar to the ones already included in preceding academic works.

Finally, as mentioned already, precisely about the effectiveness of cloud computing in virtual project management, there have not yet been academic research studies made. The only directly related study was conducted by a corporation called Siemens Enterprise Communications (SEC) in 2012. Comparing to their findings, only one of their results can be supported by this thesis which is that while 75% of the respondents find video-audio tools supporting, only 34% use those tools. In this thesis, 100% of the participants of the survey believe that video-audio calls are effective, however, only 14% use it every day and only 42% use it few times a months. Other respondents use it even less frequently. Additionally, SEC also found that telephone and email are the most frequently used tools for collaboration. This study, however, finds that email, and online messaging are the two most frequently used tools, and telephone is only the third choice. Also, the results of SEC tells that only 54 % consider telephone and email suitable for collaboration in virtual teams, while in this study email and telephone are both considered very effective or suitable by all the surveyed. Furthermore, in the research of SEC only 57% of the users are satisfied with the available collaboration tools, in contrast, in this study all participants are very satisfied or satisfied with their options for collaboration. Also, SEC indicates that 75% of their respondents are confused or upset in virtual teams. Although, exactly this was not asked in this research, presumably, it would not be true for the participants of this research. First of all, because 24% of the asked prefer working in virtual teams, and 62% say it is the same for them as in traditional teams, thus they must not think it is more confusing or more upsetting to work in a virtual team. Also, while confusion and distorted information flow emerged as challenges by some of the participants, those were not supported by the majority. So, all in all, out of the 5 findings of SEC, 4 are comparable to this research which of 3 are different, and only 1 of their findings can be supported by the results of this thesis.

Some findings from the other reviewed and relating, but not directly connecting studies have been chosen to be compared. This study has found similar connections between IT skills, IT knowledge, and willingness to use cloud collaboration tools as Xin (2105) found between the experience with SaaS tools, and the computer skills of the users, and the satisfaction, the perceived usefulness and the intention to continue working with cloud tools. Based on the interviews, it turned out that virtual project managers believe that the better IT skills in general or previous experience with IT tools someone has, he or she is more willing to continue using those tools, also he or she is more comfortable with the usage of those. Also, the results of IBM (2014) and of Forbes Insights (2013) can be supported by this study. The results of the survey show that virtual team members and

managers agree that cloud computing tools enhance business processes and helps better decision making.

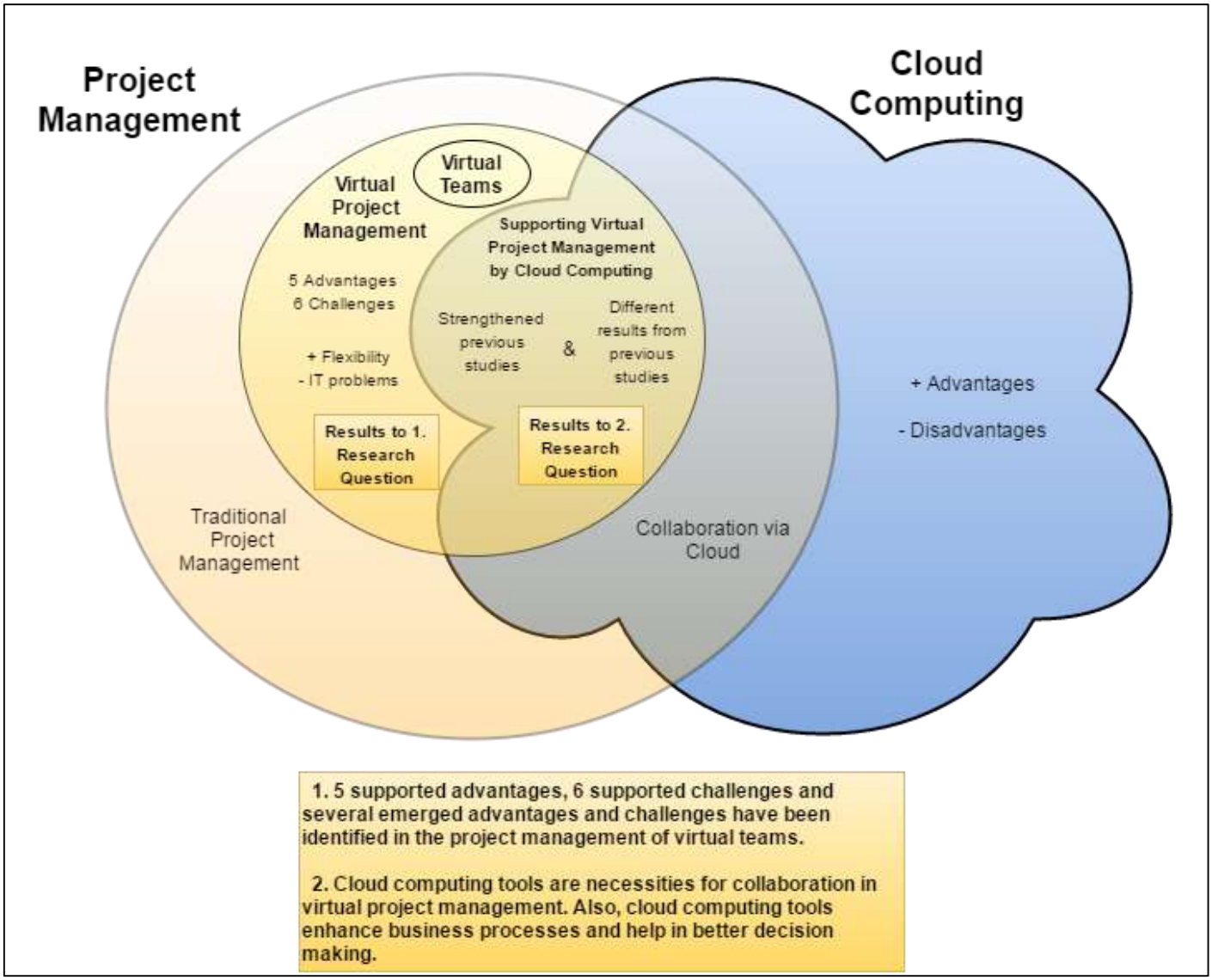

Figure 15.: Synthesis of the results with the theoretical framework

To sum up, as illustrated on Figure 15., the results of this master's thesis can be well incorporated to the theoretical framework. Addressing the first research question, regarding the supported advantages in the project management of virtual teams, 4 new advantages and only 1 already identified advantage have been revealed by this thesis. The new advantages are working globally, working with foreign people, better effectiveness, and faster information flow. Flexibility is the only identical advantage from the supported advantages of this thesis that have been mentioned in previous studies as well. Identified challenges in the project management of virtual teams by this thesis mainly overlap with the findings of the previously reviewed studies, but there are 2 meaningful challenges only revealed by this study which both related to IT issues. The identified challenges of this thesis that are different

from previous academic results are technical issues and different IT knowledge of the virtual team members. Regarding the second research question, which was aiming the gap at the cross-section of virtual project management and cloud computing, according to the results of this thesis, cloud computing tools are considered as necessities for the project management of virtual teams. Furthermore, results indicate that the adoption and usage of cloud computing tools enhance business processes and help in better decision making in the project management of virtual teams. Overall, some, but not all results from previous studies have been strengthened by this thesis, nevertheless, the findings of this research contain new and relevant information for the academic cyclorama.

5. DISCUSSION AND CONCLUSIONS

Thank so to the developments in the fields of IT and ICT, the XXIst century has become a new era where there is no limitation in information availability, and there are no physical boundaries for international collaboration, cooperation, or communication. Technological innovations have been happening at a speed never seen before. As a result, a new economy of the information society have been born which is full with new business forms and new technologies. One of the newly created working form is virtual project management, while a well-known, recently developped computer technology is cloud computing.

The purpose of this research was to explore and analyse virtual project management, and to find possible solutions to mitigate its challenges with tools of cloud computing. To achieve this purpose, the research had two research questions:

- What are the perceived advantages and challenges in the project management of virtual teams?
- How can cloud computing tools support the project management of virtual teams?

5.1. Problem setting and research questions concluded

In relation to the first research question, several previous research studies about virtual project teams and virtual project management in general, and about the emerging advantages and disadvantages within the field were studied in the literature review. The reviewed works were studying the positive and the negative characteristics of virtual project management, although, the positive ones less intensively than the negatives. However, only one relevant, not academic but corporate, study was found about how cloud computing might support virtual project management. Therefore, the second research question of this thesis could focus on a not yet carefully analysed topic aiming to contribute with some new knowledge to the academic cyclorama. For conducting the research, qualitative methodology was chosen. The results were gained from online questionnaire survey targeting virtual team participants, members as well as managers, and from in depth qualitative interviews targeting virtual project managers.

5.2. Conclusion of the results

Summing up the results, the revealed advantages and challenges in the project management of virtual teams were categorised into supported and emerged groups. An advantage or challenge was supported if at least half of the participants, or more than 2 interviewed virtual managers perceived that. Emerged characteristic was an advantage or challenge mentioned by at least one participant whether

in the survey or during the interviews. According to this categorisation, 5 supported, and 12 emerged advantages were identified. The supported advantages were working globally, working with foreign people, better effectiveness, faster information flow, and flexibility. The emerged advantages were cost reduction, better visualisation, global operation, better monitoring, better recruitment options, up-to-date documentation, diversity in team, possibility of home office, practice of foreign language, gaining higher IT knowledge, increased global knowledge, and getting to know different cultures. On the other hand, 6 supported, and 14 emerged virtual project management challenges were found. The supported challenges were different time zones, lack of face-to-face contact, lack of personal relationships, technical issues, more difficult cooperation, and different IT knowledge. The emerged challenges were confusion and distorted information flow, free riding, cultural differences, difficulty of performance measurement, feeling of isolation, different language skills, difficulty to gain respect, worse visualisation, multitasking at meetings, different benefits, different holiday seasons, lack of trust, and different policies at sites.

Findings relating to the second research question indicate that email, online messaging and telephone are the three most frequently used collaboration tools in virtual cooperation and communication. Considered as effective collaboration tools by virtual teams are, however, online messaging, email, telephone, and audio-video calls. Based on the overall opinion and usage of cloud computing tools by virtual team members and managers, it can be stated that cloud computing does not only support project management of virtual teams, but cloud computing tools are necessities for virtual collaboration and cooperation. Furthermore, results indicate that cloud computing does support the project management of virtual teams, indeed, usage of cloud computing tools is necessary for effective virtual project management. Moreover, adoption of cloud computing in virtual teams directly supports achieving higher efficiency and better decision making next to other revealed supportive consequences.

Summing up the results, this master's thesis have created previously not revealed, new data about the advantages and challenges in the project management of virtual teams comparing to the academic cyclorama. 4 new advantages and 2 not yet identified challenges in the project management of virtual teams have been revealed. In addition, several other, less supported advantages and challenges have been identified. Furthermore, a research gap at the cross-section of virtual project management and cloud computing has been studied in this thesis. Results of this study indicate that cloud computing tools are indispensable for virtual collaboration and benefits have been gained due to the adoption and usage of cloud computing tools in virtual project management. Thus, that gap is now fulfilled by this master's study.

5.3. Limitations of the research study

As all research studies, this thesis had its own limitations. The only pool for finding the target audience for data collection was the direct and indirect network of the author which is considered as the greatest limitation of this research. In the end, 21 virtual team participants and 5 virtual project managers could be reached. Also, despite of all efforts to avoid biasing the respondents or the interviewess, there is a chance that they might have been biased. Finally, the nature of a qualitative research gives space for personal interpretations by the author which might be false. Nevertheless, the researcher of this thesis had identified these limitations and tried to bypass them during the whole research process as much as possible.

5.4. Managerial implications

All in all, the gained results are considered informative and useful not only for academics, but for virtual project managers as well. Based on the results of this study, virtual project managers and their companies can try avoiding or easing the identified challenges. The identified supported challenges should be given higher attention by the project leaders. Apart from different time zones, all difficulties can be somewhat relieved. For instance, based on the described situations when lack of face-to-face contact and lack of personal relationships emerge as challenges, audio-video calls could create more personal, friendlier virtual meetings. Especially, that since all of the surveyed believe that audo-video calls are really efficient, but yet they are not often used. Using audio-video calls helps understanding the actual happenings at the other side of the line. So, the parties can see the mimics and motions of each other, or if any disturbance happens in the background at someone, the other party realizes immediately that it is not about the person in line not taking attention. The installation of video conference room, if possible, would make possible to include more people to the same video conference at the same video stream from the office, letting some of the team sit together and also saving some broadband by this. Moreover, audio-video calls would probably ease the sometimes difficult cooperation due to the above explained added values to the conversations.

In addition, one of the interviewed project manager mentioned that her virtual members are shy, kind of introvert, thus they are not open to show their faces next to their voices at the same time. Project managers have to help their members to push their limits in order to develop. Representative communication and visual motions of negotiation must be part of improvable business skills which can be developped at frequent audio-video conferences.

Furthermore, due to the reliance on technical equipment and frequent IT issues can lower effectiveness much more in case of a virtual team than in a conventional one. In order to facilitate

this difficulty, project managers need to position their team in the company as well as possible, they need to communicate the importance of their virtual team, and their added value to the organisation in order to get the best possible IT equipments and infrastructure for their virtual members whether they work from another facility or from home office.

To add more, the challenge of different IT knowledge can be eased with special IT trainings. Companies often support for example MS Excel, or project management, or presetation trainings. In this case, virtual project managers need to lobby for other type of trainings focusing on problems noticed in virtual teams. Trainings even about simple topics that might seem useless, but were determined as time consuming lack of know-hows, such as as how to set audio-video call settings, how to share screens, how to do print screens, just to give some examples from the ones got onto surface during this research.

In addition, regarding the perceived advantages identified by this research, virtual managers and their employers should build on those before the creation and during the operation of virtual project teams. Since working globally and with foreign people are turned out to be advantages for most virtual members, people with good knowledge of the common language used in the given team and colleagues with more extrovert, more open-minded personalities would be better choices when constructing a virtual team.

Also, as results indicated, IT knowledge levels do matter, so it is suggested to put employees with at least basic IT knowledge, or with high willingness to learn about the usage of virtual collaboration tools in order to maximise efficiency of the virtual team. Furthermore, virtual project form was identified with faster information flow which might be exponentially beneficial for businesses in rapidly changing industries, such as IT, telecommunications, or fashion for instance. To sum up, the reviewed theoretical framework and the results gained by this research study can give new insights for virtual project managers or companies using virtual teams.

5.5. Future research directions

The complex field of virtual project management and its connection with cloud computing offer several choices for further research areas. Widening this research, a case study about the perceived effects of a new, cloud based project management software implemented in a virtual team would give yet not researched, and close data directly from the field about the acceptance of the implementation, the effectiveness, and other outputs of a complex cloud computing tool in virtual project management. Also, by excluding the biggest limitation of this research which was the limited access to contact virtual teams, a similar qualitative research with a larger and more diversed target group consisting

of more virtual team members and virtual managers would provide further understanding to the subject as well. Finally, since it was stated here that cloud computing tools were necessities for virtual project management, although, here not discussed in details, but the greatest weakness of cloud technologies, information security in the cloud and its possible negative outcomes on virtual project management can give tremendous space for further studies.

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APPENDICES

Appendix 1: Survey about virtual project management and cloud computing

Dear Respondent,

I'm a master student at the University of Tampere (Finland). I'm writing my master's thesis about virtual project management and cloud computing. I'd like to reach team members and project managers of virtual project teams.

Under virtual teams I understand the following: "Virtual teams are teams whose members are geographically distributed, requiring them to work together through electronic means with minimal face-to-face interaction. Often, virtual teams consist of cross-functional members working on highly interdependent tasks and sharing responsibility for team outcomes."

The survey is anonymous and the given data will only be used for academic purposes regarding my master's thesis. The test will require approximately 10 minutes.

Thank you for your help,

Gyöngyvér Acsai

- What age group do you belong to?
- What is your gender?
- Where are you from?
- What is your role in a virtual project team?
- How long have you been working in virtual teams?
- Do you prefer working in a traditional or in a virtual team? A traditional team is where your colleagues are in the same building with you, and you can often meet face-to-face.
- What is your level of IT education? IT education refers to special IT courses (organized by company, adult education, university courses), university degree in IT. Informatics course attended at elementary school are not regarded as special IT courses.
- How many hours do you use a computer during your working day?
- Please, mark that which of the followings you consider the 3 most important advantages deriving from the use of virtual teams for the companies. Please, choose only 3.
- Is there any other advantages for companies deriving from the usage of virtual teams, according to you? If there is, please, describe it, if not, go to the next question.
- The following list contains some of the most common advantages of working in a virtual team. Please, indicate that how much you feel it is an important positive characteristic of working in a virtual team for you. 'Not true for my work' = If you cannot categorise this because you do not face this in your work.

- Is there any other advantages of working in a virtual team for you? If there is, please, describe it, if not, go to the next question.
- The following list contains the most common virtual project management challenges according to academic literature. Please, indicate that how much you feel that it is a problematic characteristic for you. 'Free riding' = Passing the responsibility and the tasks toward other team members. Not doing his/her duties.
- Is there any other disadvantages of working in a virtual team for you? If there is, please, describe it, if not, go to the next question.
- Have you ever heard about cloud computing?

A quick introduction of cloud computing if you are not familiar with the phrase. Cloud computing makes it possible to deliver IT services through the Internet. So the server infrastructure should not be locally, can be far away, and the used software should not be installed to your computer, you reach everything online. Also, the documents uploaded to the cloud can be reached from anywhere with Internet connection and it is possible for more people to edit the same document. Some well-known examples for cloud computing services are: Google Docs, Netflix, Dropbox, Sharepoint, etc.

- Please, indicate that how often you use the following tools for online collaboration. 'CRM' = Customer Relationship Management, 'ERP' = Enterprise Resource Planning, 'business management software' = It refers to an online software including several services for example email, calendar, project planning tool, task organizing tool, document editor, power point editor, CRM database, ERP, accounting etc. Any of these, or other services can be included, but the used software should not necessarily contain all the mentioned functions.
- Is there any other tool that you use for online collaboration? If there is, please, describe it, if not, go to the next question.
- Please, indicate that how effective / useful you consider the following tools for online collaboration.
- Please, indicate that how comfortable you find the usage of the following collaboration tools. Here, comfortable refers to the access and availability of the tool, and the felt difficulty during usage.
- Please, indicate that how much the following cloud collaboration tools enhance business processes and/or better decision making according to you.
- Are you satisfied with the collaboration tools you can use in your work?
- If you'd like to know about the results of this study, please, add your email address.

Thank you for your time. Your answers contribute a lot to my research. Gyöngyvér

Appendix 2: Questions of the interviews

1. Would you please introduce yourself, your profession and your company in some sentences?
2. Since the survey was anonym, I'd like to ask you that how long have you been working in virtual teams?
3. How would you define a virtual team?
4. Do you prefer working in a traditional, or in a virtual team? Why?
5. How does virtual project management differ from traditional one? Do you use different project management methods, tactics for coordinating a virtual team? If yes, could you, please, mention some? Is the role of a virtual project manager different from of a traditional one?
6. As a project manager of a virtual team what challenges, difficulties have you identified, experienced which differ from the challenges of a traditional project management team?
7. And what would you mention as advantages of leading a virtual team instead of a conventional one?
8. In my thesis I'm trying to explore the correlation between IT competence, computer knowledge, usage of cloud collaboration tools and virtual project management.
9. Do you think that a better IT understanding is necessary in order to work effectively in a virtual team? Do you regard this for example at the selection of project members?
10. Based on your experience, does the level of computer skills of a team member (or regarding yourself) influence the perceived usefulness and the willingness to work with cloud computing tools?
11. What cloud computing, cloud collaboration tools do you consider essential for leading a virtual team? Here, please, think of decision making, collaboration within the team, monitoring processes or the work of your colleagues…
12. Did you know that many virtual team participant consider telephone and email not sufficient tools for proper collaboration in virtual teams? What do you think of this? How do you contact your colleagues or monitor processes?
13. I asked this because research studies showed that most virtual members believe that audio video tools are highly useful for virtual cooperation, but still only few use them. Have you experienced similar things? Do you use it?
14. Many virtual team members are not satisfied with the collaboration tools they can use in their daily work. In spite of this, my survey results do not totally reflect this, although my research is really low volume, but covers several geographic area and different industries. What is your opinion about this?
15. If there is something, what would you improve regarding the available cloud computing tools at your company?